THE AMERICAN GAS LIGHT JOURNAL

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Bound Volume, Proceedings New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF THE SECRETARY,
NEW BEDFORD, MASS., Oct. 26, 1901.

A limited number of copies of the "Proceedings" of the New England Association of Gas Engineers, for the years 1900 and 1901, remain, and single copies can be obtained on application to the Secretary, who will mail them on receipt of $2.

This volume contains several papers and the discussions thereon, and are of especial value for reference. The "Proceedings" of prior years will be published later, and the volumes will be of great value for any gas man's library. N. W. GIFFORD, Secretary.

BRIEFLY TOLD.

STATE OF THE SUBSCRIPTION TO THE WESTERN GAS ASSOCIATION'S LIBRARY AND INFORMATION FUND.—Mr. J. W. Dunbar, Secretary of the Western Gas Association, tells us that sensible additions have been made to the fund, which is under subscription for the purposes heretofore outlined in the JOURNAL, the last formal mention of which was made in our issue of November 18th. The objects of the subscription which are shown in the caption to this recounting, need no further expression here, save for the fact that the fraternity seem to require a bit of spurring to bring the matter to a satisfactory termination. The work proposed will require 3 years for its completion—all this has been plainly set out heretofore—and the benefits therefrom will be in ten fold to those who propose or hope to remain in the gas business for a period longer than 3 years from the time their subscriptions were entered. Mr. J. W. Dunbar, of New Albany, Ind., for that is his home address, as Secretary of the Western Gas Association, is ready to give the information in detail concerning the fund, and from his last word to us regarding it the status thereof is as follows—from the recapitulation a trifle over one-half the amount required is pledged, always remembering that the annual subscriptions are arranged for a period of 3 years:

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1: The respective subscriptions of the Detroit Stove Works, the Mueller Mfg. Co., and Messrs. Kahn Bros. are lump sums, and not per annum.

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Peoples Gas Light and Coke Company, Chicago	50
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Roots, P. H. & F. M., Connersville, Ind.	10
San Antonio (Texas) Gas Company	10
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Sheboygan (Wis.) Gas Company	10
Warren (O.) Gas Company	10
Waterloo (Iowa) Gas and Electric Company.	10
Windsor (Can.) Gas Company	10

"The Fuel Value of Residuals."—While the gentlemen in charge of the queerest of all operations in the coke oven line, as producers of illuminating gas, have had their full fling at Everett, Mass., it is to the full refreshing to know that an ordinary gas maker, who has lived in the East for quite a while, and who proposes to continue doing business there for an indefinite period, has declared that there is a substantial value in the instance of fuel residuals, resulting from the primary conversion of coal into gas. Mr. Charles F. Prichard, of Lynn, Mass., is the gentleman to whom we refer, and his paper regarding the fuel value of such residuals was read at the last meeting of the American Gas Light Association—the text of the paper is carried in our issue dated November 18th last. Mr. Prichard is the active man in the management of the Lynn Gas and Electric Company, and in connection with such management he has not encountered a financial assistance from his superiors that would put him in the wasteful class. Meanwhile his "superiors," through his watchfulness mainly, have had their dividends, while he often pondered how the dividend charge was to be fairly earned. The results of his attention to duty twice done are handsomely shown in his paper read at the last meeting of the American Gas Light Association, the lines of which will be scanned closely by those who in the future prefer to make and sell gas as a mainstay, coke and tar being later considerations. The tables given in the paper are the actual results of much work done by a careful, methodical man, and some of the findings respecting the subject treated cannot be found in any of the text books that tell of such things. The paper is an excellent one, and the "Sage of Lynn" is to be complimented on the expert (and modest) manner with which he put holes in the hives of the "gas men" whose primal business is to make coke.

Notes.—With much regret we report the death of Mrs. Louisa A. Steinwedell, the wife of Captain Wm. Steinwedell, former President of the Quincy (Ills.) Gas Light and Coke Company, and mother of Mr. Wm. E. Steinwedell, Superintendent of the Belleville (Ills.) Gas Light and Coke Company. Deceased, who was in her 60th year, was a native of New Orleans La., and was united in marriage to Captain Steinwedell shortly after their first meeting in Quincy in 1859. She was of the true motherly type, whose thought was always for her home and its harmony.——Col. Arthur W. Sloper, President of the Safety Car Heating and Lighting Company, of this city, died at his home, 150 Central Park West, the morning of the 1st inst. He was in his 63d year.——Mr. E. Hayes Trowbridge, for many years prominent in the directorate of the New Haven (Conn.) Gas Light Company, died at his home in New Haven the night of Saturday, Nov. 30th. He was in his 61st year. He was Vice-President of the Boston and New York Air Line Railroad and was a Director in the New York, New Haven and Hartford Railroad.——A look through our advertising columns will show that a good piece of gas property will be sold at auction on the 6th prox. The property is that known under and by the corporate title of the Huntsville (Ala.) Gas Light Company.

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[Continued from Page 881.]

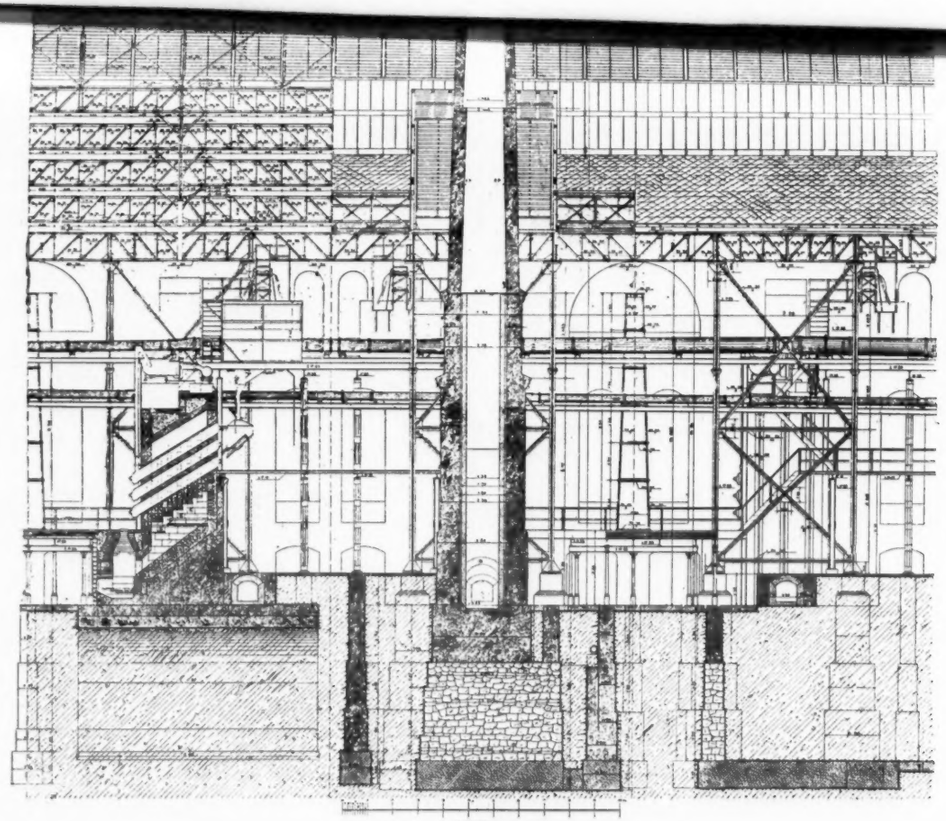
The Vienna Municipal Gas Works.[1]

The Retort House.—The retort house with its equipment is naturally spoken of as the most costly part of the whole gas works plant at Vienna. It is 202 feet 6 inches wide, inside measurement, and 929 feet 6 inches long. The side walls are 49 feet 3 inches high to the roof supports. Referring to Plate I., Fig. 1 is a cross section and Fig. 2 a longitudinal section of the house. As 30 more settings are to be erected at some later date under each side span of the house, making 60 more in all, the present gable ends, and the bath and dressing rooms at the ends of the house, must be considered as only provisionally established there. Herr Herrmann had originally planned the house with a single roof; but it was decided to make it with a roof in 3 spans, as shown in the drawings. The central span is formed by 20 rectangular iron lattice columns, 26 feet 5 inches by 18 feet. The angles of these columns consist of 2 lengths of **U**-iron, 11 inches deep, and are joined by diagonal and horizontal ties to one another, so as to form a rigid lattice column. The tops of the columns are connected lengthwise of the house by box girders, and crosswise by lattice girders 41½ inches deep. Inside 18 of these lattice columns are erected the chimneys for the spent furnace gases. A low roof covers this middle section of the house; and on it are erected, around each chimney, open ventilating lanterns 18 feet 3 inches high.

The two side spans of the house are each 88 feet wide, inside measurement. Each of the iron roof rafters rests in the middle on, and is firmly secured to, one of the lattice columns; and its second point of support is by means of a movable sliding bed plate on the retort house wall. The iron columns in the middle therefore form the fixed part of the roof structure; while the movable ends, resting on the outer walls, are free to follow the fluctuations of temperature. The principal rafters are 39 feet 4 inches apart; and, at intervals of twice that distance, are inserted dilatation contrivances to allow of expansion of the roof longitudinally taking place without disturbance of the structure. Each alternate pair of rafters is secured against displacement by a diagonal wind tie. The couples of the principal rafters are joined by 8 lattice girders 41 inches deep, acting as purlins; and these again are each connected, at distances of 13 feet 2 inches, by angle irons running parallel to the rafters. In the middle of each roof is placed a lantern, open at both sides, 17 feet 8 inches wide and 12 feet 5 inches high, and covered with galvanized iron roofing with plank lining. One half of the rest of the roof is of glass, and the other half of slates, with plank lining on wooden rafters. Thus the house is lighted both from the sides and roof. The overlapping sections of the glass roofing are placed nearly 2 feet apart; so that on each roof there are thus provided 4 continuous openings serving to ventilate the house. Provision is made for gaining access to the roofs for repairs, etc., by 4 travelling ladders, reached by staircases from the towers in the front of the house facing the coke yard. The weight of iron used in the columns and roofs of the retort house is 1,558 tons. An illustration is given of the retort house before completion.

The settings are exclusively of the Coze pattern. There are 9 retorts in each, 11 feet 9 inches long, and inclined at an angle of about 32°. The retorts are 20½ inches wide and 15 inches high. There are 180 settings, in benches of 5. The brickwork of the bench has a depth of 9 feet 10 inches, a length of 68 feet 11 inches, and a height of 27 feet 10 inches. The benches are arranged in 18 pairs, at right angles to the longitudinal axis of the house (see Fig. 3, Plate I.). There are 1,620 retorts in all, taking charges of 550 pounds of coal. With good Ostrau coal, each setting of 9 was guaranteed by the contractors to yield 98,000 cubic feet of gas per 24 hours. One chimney serves for a pair of benches, or 10 settings. The 180 settings are intended only to meet immediate requirements; being designed for a maximum daily output of 15,256,000 cubic feet, and an annual output of 3,050 millions. The rest of the works has, however, already been constructed for a maximum daily output of 17,658,000 cubic feet, for which the settings also will be extended when required. Hasse-Didier generators, charged with the coke drawn from the 3 middle retorts, supply the producer gas for heating the settings. The mouths of the generators are on the stage level, for convenience of charging with the hot coke from the retorts. The contractors guaranteed that the consumption of coke in the settings would not exceed 16 per cent. of the weight of the coal carbonized; and this guarantee has been fulfilled in working. The products of combustion, after being utilized for heating the air required for combustion, pass into the flue which runs at the back of, and parallel to, the settings. This flue is 31½ inches square; and where it enters the chimney

1. *Journal of Gas Lighting.*



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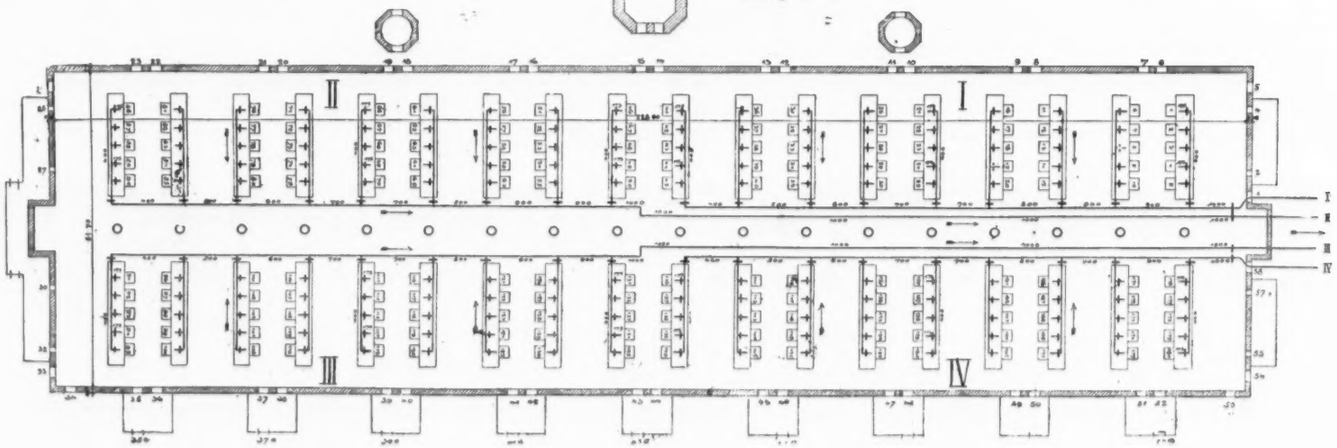

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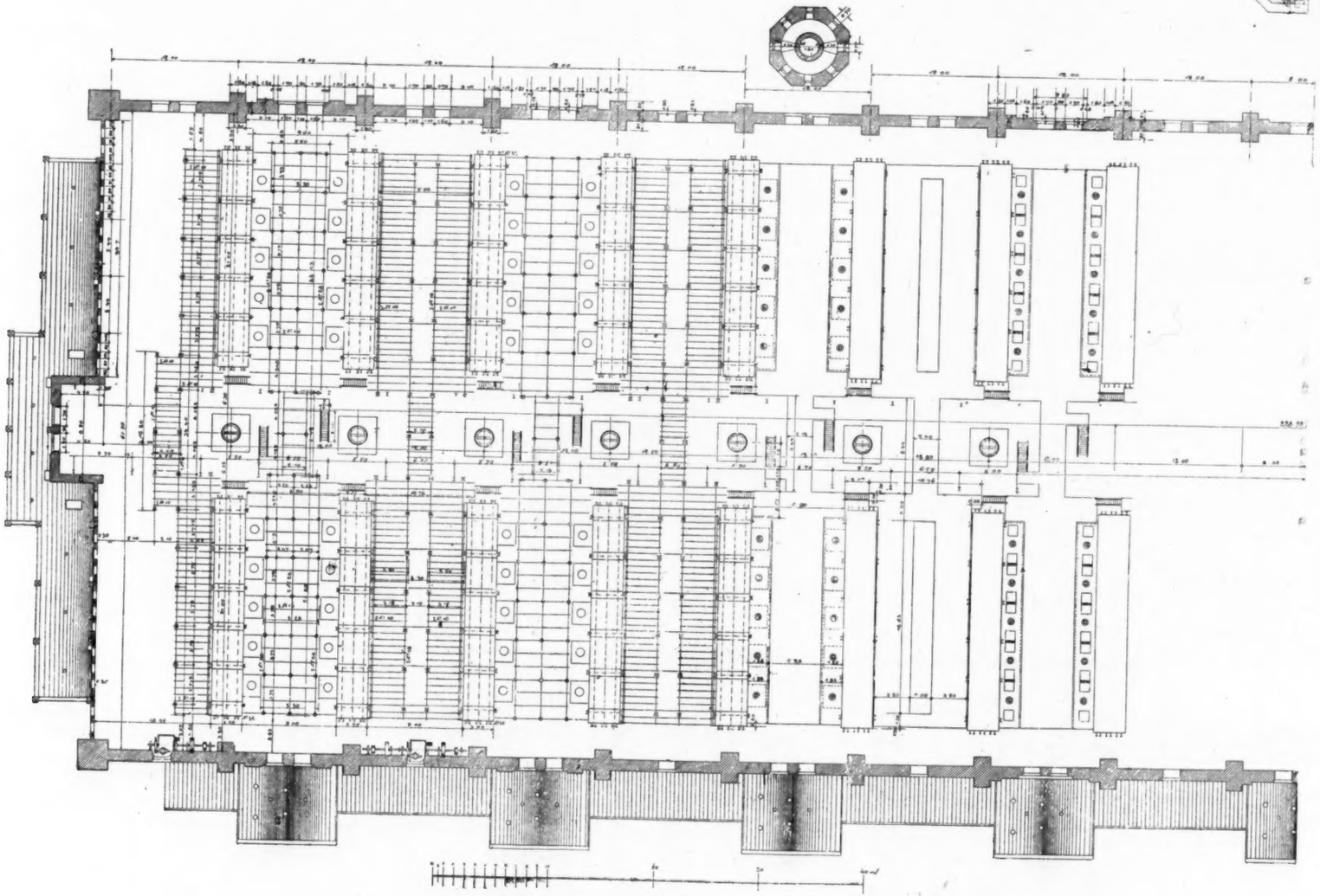
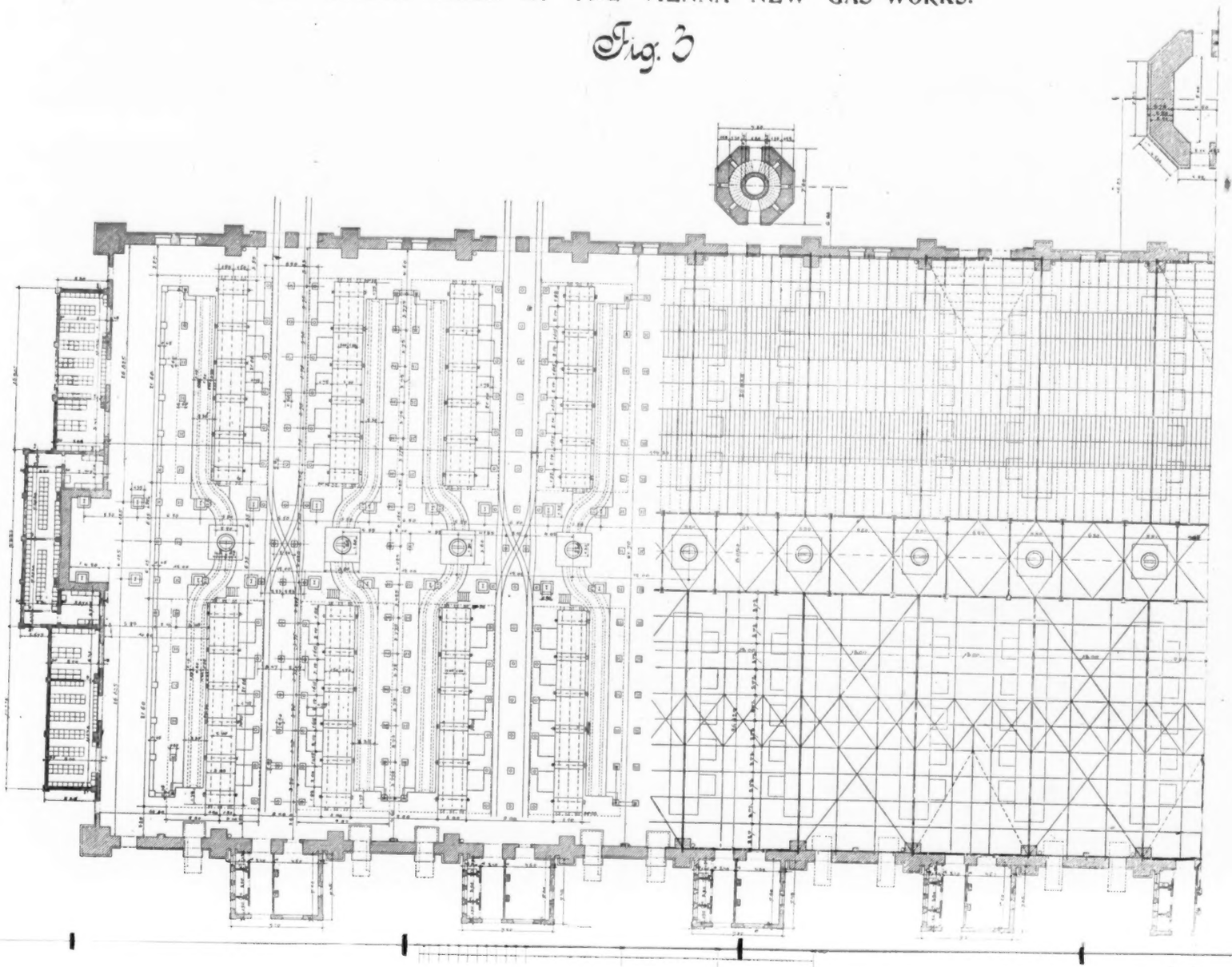


THE RETORT HOUSE AT THE VIENNA NEW GAS WORKS.

Fig. 3



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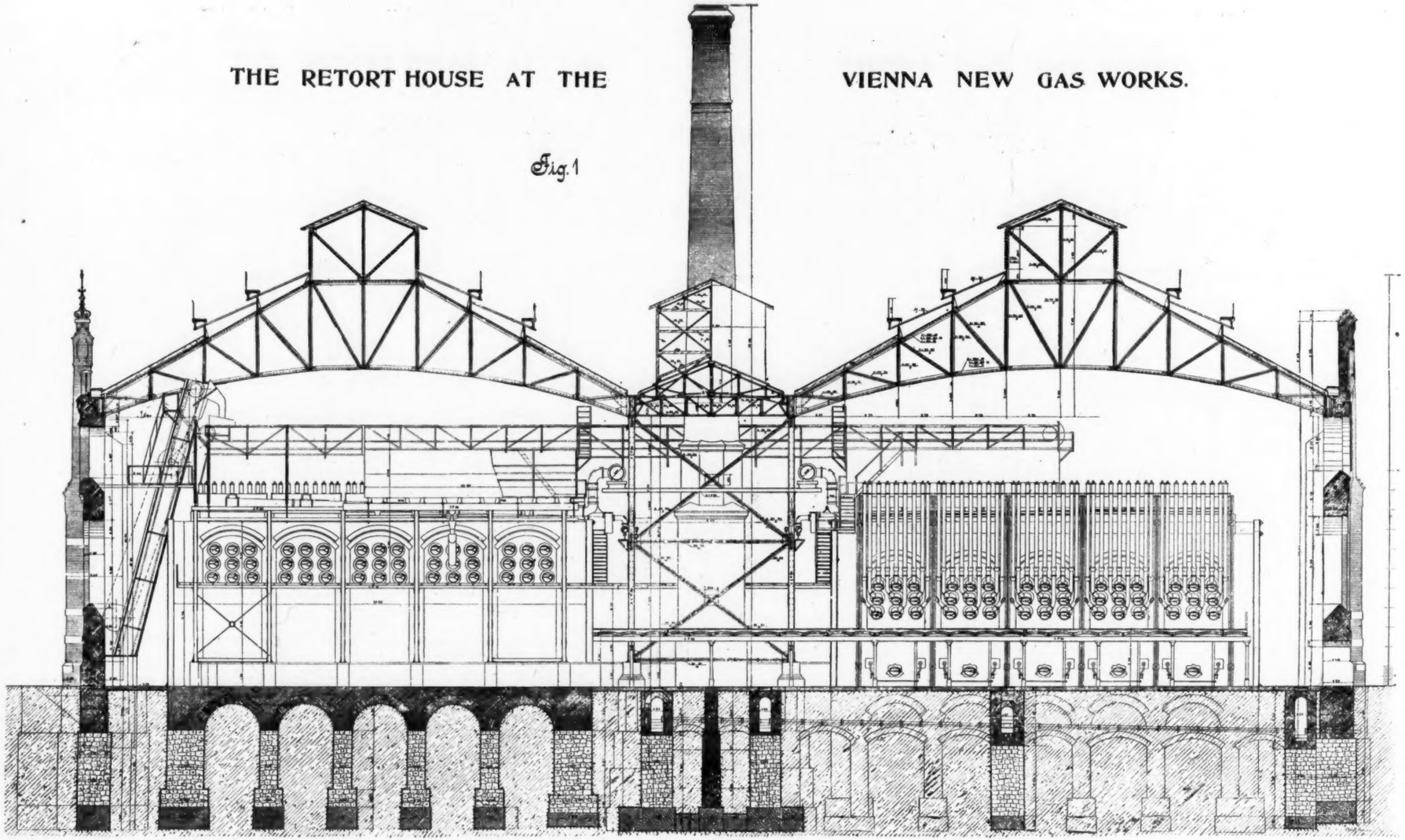

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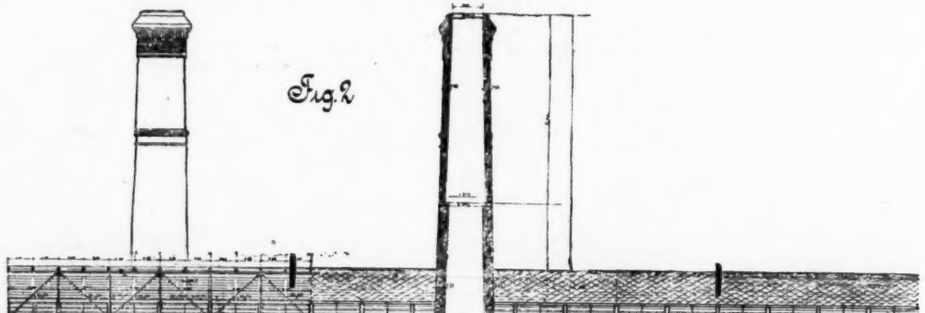

Supplement to AMERICAN GAS LIGHT JOURNAL, Dec. 9, 1901.

Fig. 5

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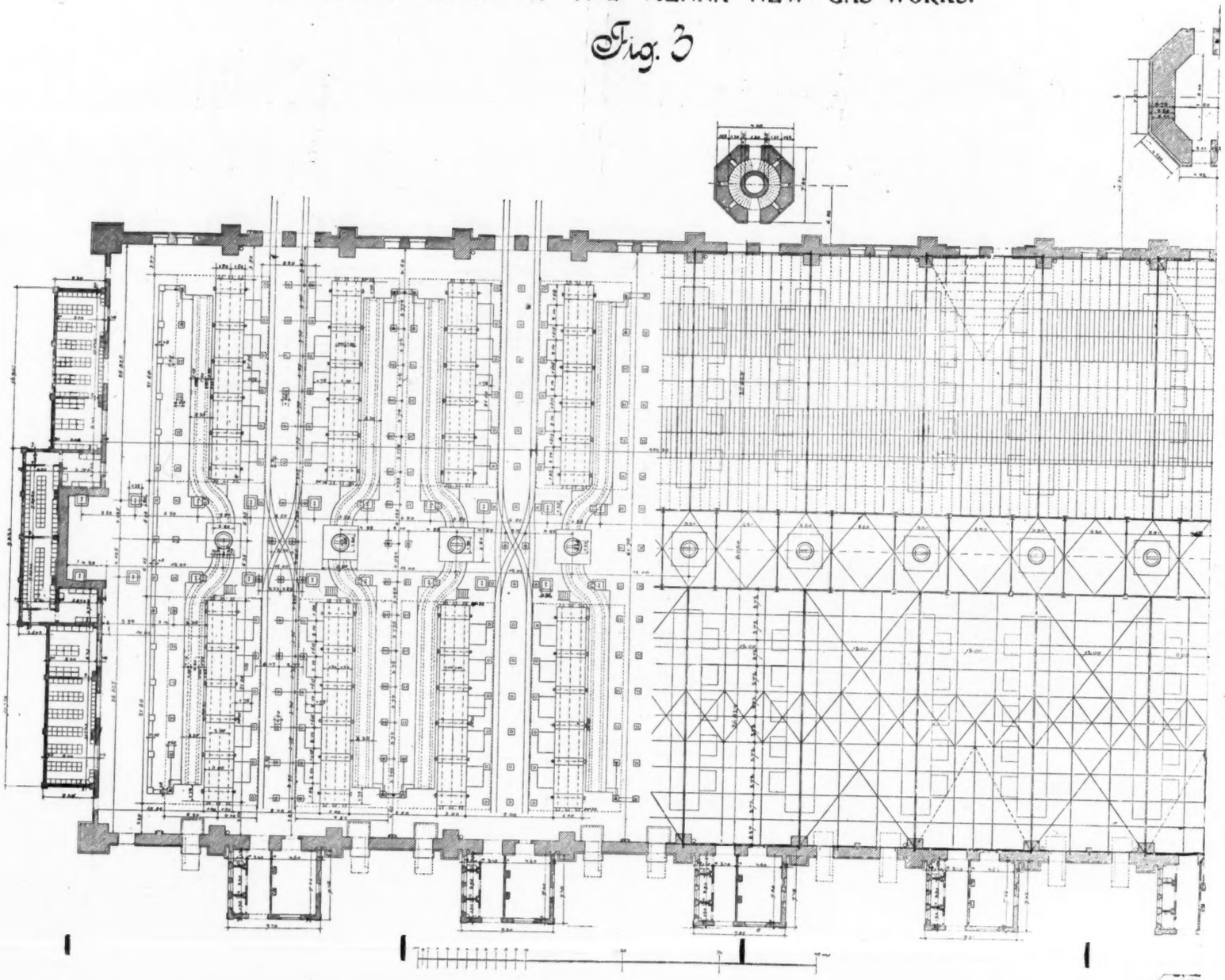

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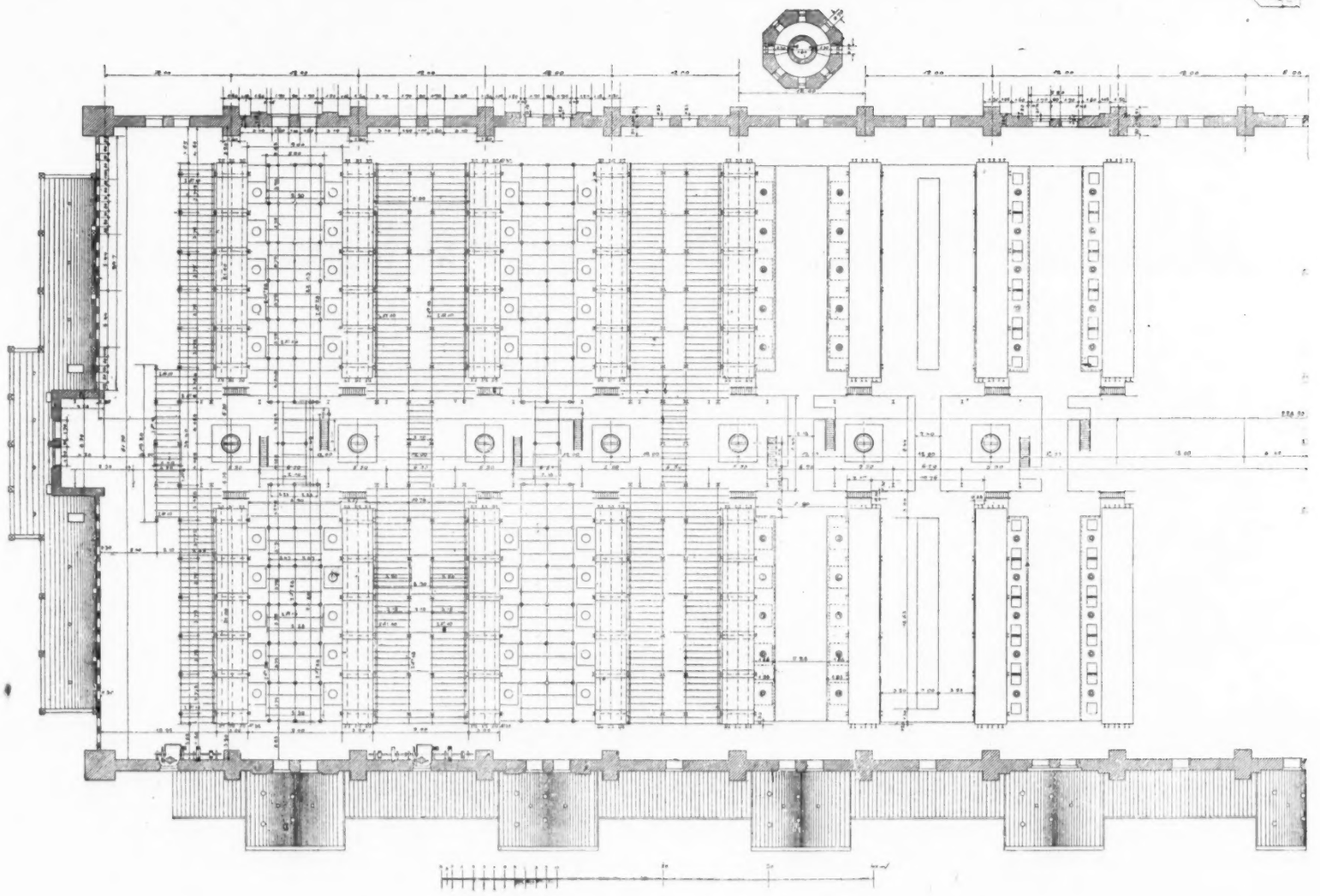

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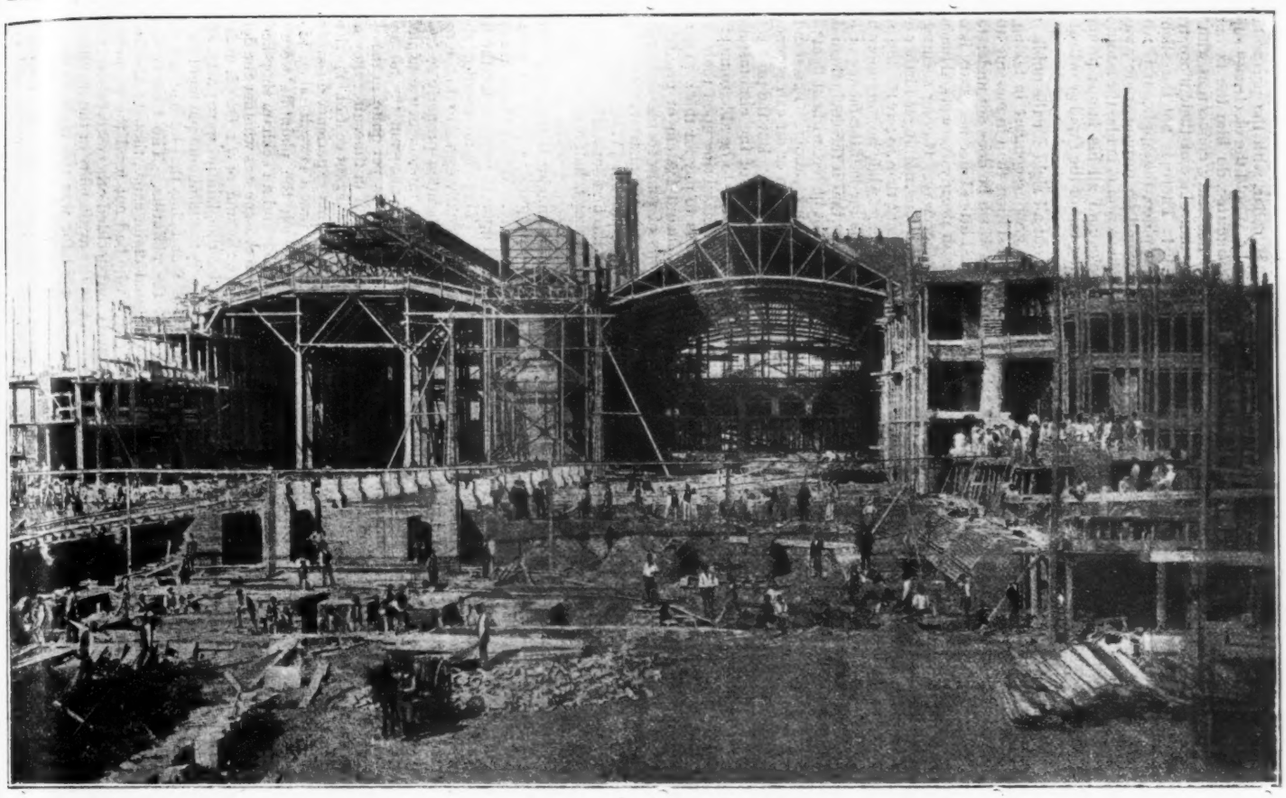


a firebrick slide serves as a valve to regulate the draught. The chimneys, of which there are 18 altogether on the works, are nearly 115 feet high and 3 feet 11 inches in width internally, and are lined for 41 feet from their base with firebrick.

The construction of the retort house was actually started on the 15th of March, 1897; and considerable trouble was experienced from the bad character of the subsoil. But the building was nevertheless completed by the 1st of July, 1898; and the whole of the 180 settings were ready for use by the end of July, 1899. The space in the retort house is divided in the following manner: Alongside each of the two principal walls there is a passage way, 10 feet 6 inches wide. From these run, toward's the middle of the house, the benches of retorts, nearly 71 feet long; and finally there is a central space, 26 feet 6 inches wide, in which are th chimneys. The benches of settings, placed back to back, are 39 feet 4 inches apart, axis to axis; hence the clear intervening space is 29 feet 6 inches. The benches are so arranged that they come alternately face to face and back to back.

The generator furnaces stand out 5 feet 9 inches from the face of the setting, and are 7 feet wide (See Fig. 4, Plate I). The clear space between the faces of the generators is 18 feet wide; and through it run two tramway lines, of 24-inch gauge, for the removal of the coke and clinker in tipping wagons. The floor of the house is of concrete. The roof of the basement is of brick arches, supported by an iron framing resting on cast iron columns. The drawing stages are 9 feet 10 inches above the floor of the house. There are openings, closed by trapdoors, opposite the side rows of retorts in each setting, for the coke to fall direct as it is drawn from the retorts into the wagons on the tramway below, where it is sprinkled, and then pushed out of the house. For carrying off the fumes from the sprinkling of the coke, there are two shafts, extending from the roof of the basement nearly to the lanterns in the roof of the house. Most of the vapors, however, pass up through the openings in the gangways. The drawing of the retorts is accomplished with very little assistance after the check plate has been removed. The pitch which collects at the lower mouthpieces is received in a bucket held for the purpose. This is the only unpleasant operation; and it is one which requires a certain amount of skill.

The charging stages, consisting of ribbed iron plates on an iron framing, stand some 17 feet 8 inches above the floor of the house. The center part is open, and protected by a railing. The retorts are charged according to Riegel's system, in which charging receptacles suspended from a rail are pushed along the front of the benches. Each bench has an overhead coal hopper, holding about 63 tons of coal, for the supply of the 5 beds of retorts. Each of these fixed hoppers is provided with 6 outlets, closed by slides, from which the charging receptacles are filled, and are then pushed along to the retorts. A special charging receptacle is provided for each horizontal tier of retorts. The coal is discharged from them into the retorts quickly and uniformly.

Iron staircases are placed in the middle of the house, for passing from one stage to another, and for gaining access to the coal hoppers and tops of the benches. The machinery for preparing the coal is on that side of the house which faces the coal sheds. There are 18 coal breakers—one breaker for each bench—with elevators and band conveyors. An electromotor is placed between alternate sets of breaker, elevator and conveyor, and drives two sets. The coal is brought from the storage heaps in the small tipping wagons, and is discharged close to the coal breaker on to a cast iron grid, through which the small coal falls at once into the elevator pit, while the large coal is shoveled into the coal breaker, whence the broken coal also falls into the pit. The coal is raised from the pit by a bucket elevator to a height of 60 feet 6 inches. The elevator runs in a closed shoot, in order to avoid the scattering of dust, etc. It discharges the coal into a trough 142 feet long, in which runs a chain conveying band, which carries the coal to the hoppers, into which it falls through openings in the bottom of the trough, which may be closed at will. Each coal breaker supplies two hoppers. Each breaker and elevator deals with 10 tons per hour.

The bridge and dip pipes are provided with self-closing Didier seals. The wrought iron collecting main has movable supports and Drory outlets and cleansing arrangements. The outlet pipes are 8 inches in diameter, and take both the gas and the condensed products. Each outlet has a special valve by means of which any setting may be shut off. The collecting mains for each bench are nearly 16 inches in diameter. From these the gas passes into four distinct foul mains, which are attached to the main columns of the house. Provision is made at intervals to meet the expansion and contraction of these mains (see Figs. 1 and 2. Plate I.). These four mains divide the working of the house into 4 sections, as is shown by Fig. 5, Plate I. There are two tar mains placed beneath these 4 mains; and they unite in one main, nearly 16 inches in diameter, at the east end of the house. This main leads to the separating tank, which precedes the tar and liquor wells. The 4 gas mains in the retort house gradually increase in diameter from 16 inches to nearly 40 inches, which is their diameter as they emerge from the house at its east end. Here there are vertical connections to underground mains of the same size leading to the condenser house.

[To be Continued.]

Subscriber.	Per Annum.
Kahn, F. & L. Bro., Hamilton, O.	100[1]
Kentucky Heating Company, Louisville, Ky.	10
Keystone Meter Company, Royersford, Pa.	10
Lansing (Mich.) Gas Company	20
Light, Heat and Power Company, Boston, Mass.	10
Lima (O.) Gas Company	10
Louisville (Ky.) Gas Company	50
Lynchburg (Va.) Gas Company	10
McDonald & Company, D., Albany, N. Y.	10
Michigan City (Ind.) Gas Company	10
Miller, Thos. D., Dallas, Texas.	5
Mueller Mfg. Company, Decatur, Ills.	25[1]
Nettleton, C. H., Derby, Conn	30
New Orleans Lighting Company, New Orleans, La.	50
Ogden Gas Company, Chicago, Ills.	50
Peoples Gas Light and Coke Company, Chicago	50
Peoples Power Company, Moline, Ills.	20
Portsmouth (O.) Gas Company	10
Philadelphia Suburban Gas Company, Darby, Pa.	20
Roots, P. H. & F. M., Connersville, Ind.	10
San Antonio (Texas) Gas Company	10
Shelton, F. H., Philadelphia, Pa.	10
Sheboygan (Wis.) Gas Company	10
Warren (O.) Gas Company	10
Waterloo (Iowa) Gas and Electric Company.	10
Windsor (Can.) Gas Company	10

"THE FUEL VALUE OF RESIDUALS."—While the gentlemen in charge of the queerest of all operations in the coke oven line, as producers of illuminating gas, have had their full fling at Everett, Mass., it is to the full refreshing to know that an ordinary gas maker, who has lived in the East for quite a while, and who proposes to continue doing business there for an indefinite period, has declared that there is a substantial value in the instance of fuel residuals, resulting from the primary conversion of coal into gas. Mr. Charles F. Prichard, of Lynn, Mass., is the gentleman to whom we refer, and his paper regarding the fuel value of such residuals was read at the last meeting of the American Gas Light Association—the text of the paper is carried in our issue dated November 18th last. Mr. Prichard is the active man in the management of the Lynn Gas and Electric Company, and in connection with such management he has not encountered a financial assistance from his superiors that would put him in the wasteful class. Meanwhile his "superiors," through his watchfulness mainly, have had their dividends, while he often pondered how the dividend charge was to be fairly earned. The results of his attention to duty twice done are handsomely shown in his paper read at the last meeting of the American Gas Light Association, the lines of which will be scanned closely by those who in the future prefer to make and sell gas as a mainstay, coke and tar being later considerations. The tables given in the paper are the actual results of much work done by a careful, methodical man, and some of the findings respecting the subject treated cannot be found in any of the text books that tell of such things. The paper is an excellent one, and the "Sage of Lynn" is to be complimented on the expert (and modest) manner with which he put holes in the hives of the "gas men" whose primal business is to make coke.

NOTES.—With much regret we report the death of Mrs. Louisa A. Steinwedell, the wife of Captain Wm. Steinwedell, former President of the Quincy (Ills.) Gas Light and Coke Company, and mother of Mr. Wm. E. Steinwedell, Superintendent of the Belleville (Ills.) Gas Light and Coke Company. Deceased, who was in her 60th year, was a native of New Orleans La., and was united in marriage to Captain Steinwedell shortly after their first meeting in Quincy in 1859. She was of the true motherly type, whose thought was always for her home and its harmony.——Col. Arthur W. Sloper, President of the Safety Car Heating and Lighting Company, of this city, died at his home, 150 Central Park West, the morning of the 1st inst. He was in his 63d year.——Mr. E. Hayes Trowbridge, for many years prominent in the directorate of the New Haven (Conn.) Gas Light Company, died at his home in New Haven the night of Saturday, Nov. 30th. He was in his 61st year. He was Vice-President of the Boston and New York Air Line Railroad and was a Director in the New York, New Haven and Hartford Railroad.——A look through our advertising columns will show that a good piece of gas property will be sold at auction on the 6th prox. The property is that known under and by the corporate title of the Huntsville (Ala.) Gas Light Company.

1. The respective subscriptions of the Detroit Stove Works, the Mueller Mfg. Co., and Messrs. Kahn Bros., are lump sums, and not per annum.

[Continued from Page 881.]

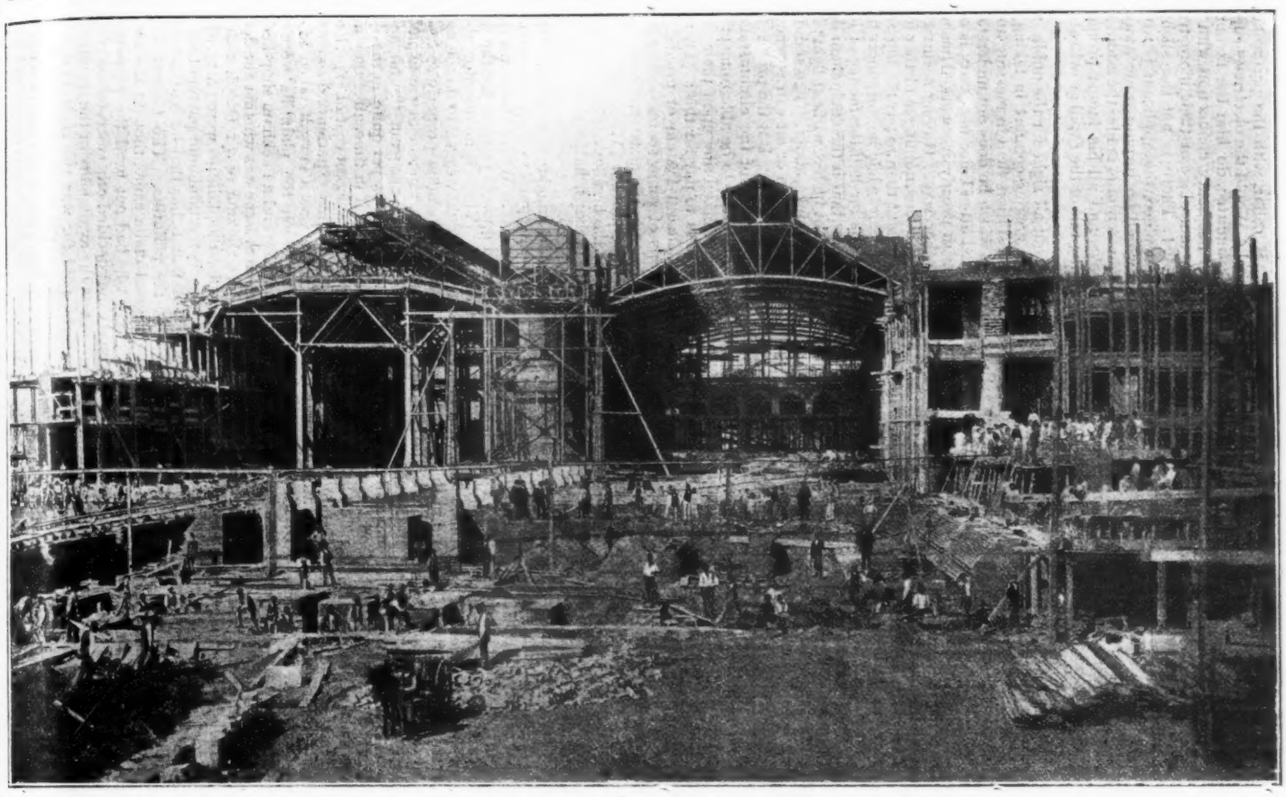
The Vienna Municipal Gas Works.[1]

The Retort House.—The retort house with its equipment is naturally spoken of as the most costly part of the whole gas works plant at Vienna. It is 202 feet 6 inches wide, inside measurement, and 929 feet 6 inches long. The side walls are 49 feet 3 inches high to the roof supports. Referring to Plate I., Fig. 1 is a cross section and Fig. 2 a longitudinal section of the house. As 30 more settings are to be erected at some later date under each side span of the house, making 60 more in all, the present gable ends, and the bath and dressing rooms at the ends of the house, must be considered as only provisionally established there. Herr Herrmann had originally planned the house with a single roof; but it was decided to make it with a roof in 3 spans, as shown in the drawings. The central span is formed by 20 rectangular iron lattice columns, 26 feet 5 inches by 18 feet. The angles of these columns consist of 2 lengths of U-iron, 11 inches deep, and are joined by diagonal and horizontal ties to one another, so as to form a rigid lattice column. The tops of the columns are connected lengthwise of the house by box girders, and crosswise by lattice girders 41½ inches deep. Inside 18 of these lattice columns are erected the chimneys for the spent furnace gases. A low roof covers this middle section of the house; and on it are erected, around each chimney, open ventilating lanterns 18 feet 3 inches high.

The two side spans of the house are each 88 feet wide, inside measurement. Each of the iron roof rafters rests in the middle on, and is firmly secured to, one of the lattice columns; and its second point of support is by means of a movable sliding bed plate on the retort house wall. The iron columns in the middle therefore form the fixed part of the roof structure; while the movable ends, resting on the outer walls, are free to follow the fluctuations of temperature. The principal rafters are 39 feet 4 inches apart; and, at intervals of twice that distance, are inserted dilatation contrivances to allow of expansion of the roof longitudinally taking place without disturbance of the structure. Each alternate pair of rafters is secured against displacement by a diagonal wind tie. The couples of the principal rafters are joined by 8 lattice girders 41 inches deep, acting as purlins; and these again are each connected, at distances of 13 feet 2 inches, by angle irons running parallel to the rafters. In the middle of each roof is placed a lantern, open at both sides, 17 feet 8 inches wide and 12 feet 5 inches high, and covered with galvanized iron roofing with plank lining. One half of the rest of the roof is of glass, and the other half of slates, with plank lining on wooden rafters. Thus the house is lighted both from the sides and roof. The overlapping sections of the glass roofing are placed nearly 2 feet apart; so that on each roof there are thus provided 4 continuous openings serving to ventilate the house. Provision is made for gaining access to the roofs for repairs, etc., by 4 travelling ladders, reached by staircases from the towers in the front of the house facing the coke yard. The weight of iron used in the columns and roofs of the retort house is 1,558 tons. An illustration is given of the retort house before completion.

The settings are exclusively of the Coze pattern. There are 9 retorts in each, 11 feet 9 inches long, and inclined at an angle of about 32°. The retorts are 20½ inches wide and 15 inches high. There are 180 settings, in benches of 5. The brickwork of the bench has a depth of 9 feet 10 inches, a length of 68 feet 11 inches, and a height of 27 feet 10 inches. The benches are arranged in 18 pairs, at right angles to the longitudinal axis of the house (see Fig. 3, Plate I.). There are 1,620 retorts in all, taking charges of 550 pounds of coal. With good Ostrau coal, each setting of 9 was guaranteed by the contractors to yield 98,000 cubic feet of gas per 24 hours. One chimney serves for a pair of benches, or 10 settings. The 180 settings are intended only to meet immediate requirements; being designed for a maximum daily output of 15,256,000 cubic feet, and an annual output of 3,050 millions. The rest of the works has, however, already been constructed for a maximum daily output of 17,658,000 cubic feet, for which the settings also will be extended when required. Hasse-Didier generators, charged with the coke drawn from the 3 middle retorts, supply the producer gas for heating the settings. The mouths of the generators are on the stage level, for convenience of charging with the hot coke from the retorts. The contractors guaranteed that the consumption of coke in the settings would not exceed 16 per cent. of the weight of the coal carbonized; and this guarantee has been fulfilled in working. The products of combustion, after being utilized for heating the air required for combustion, pass into the flue which runs at the back of, and parallel to, the settings. This flue is 31½ inches square; and where it enters the chimney,

1. *Journal of Gas Lighting.*



a firebrick slide serves as a valve to regulate the draught. The chimneys, of which there are 18 altogether on the works, are nearly 115 feet high and 3 feet 11 inches in width internally, and are lined for 41 feet from their base with firebrick.

The construction of the retort house was actually started on the 15th of March, 1897; and considerable trouble was experienced from the bad character of the subsoil. But the building was nevertheless completed by the 1st of July, 1898; and the whole of the 180 settings were ready for use by the end of July, 1899. The space in the retort house is divided in the following manner: Alongside each of the two principal walls there is a passage way, 10 feet 6 inches wide. From these run, toward's the middle of the house, the benches of retorts, nearly 71 feet long; and finally there is a central space, 26 feet 6 inches wide, in which are th' chimneys. The benches of settings, placed back to back, are 39 feet 4 inches apart, axis to axis; hence the clear intervening space is 29 feet 6 inches. The benches are so arranged that they come alternately face to face and back to back.

The generator furnaces stand out 5 feet 9 inches from the face of the setting, and are 7 feet wide (See Fig. 4, Plate I). The clear space between the faces of the generators is 18 feet wide; and through it run two tramway lines, of 24-inch gauge, for the removal of the coke and clinker in tipping wagons. The floor of the house is of concrete. The roof of the basement is of brick arches, supported by an iron framing resting on cast iron columns. The drawing stages are 9 feet 10 inches above the floor of the house. There are openings, closed by trapdoors, opposite the side rows of retorts in each setting, for the coke to fall direct as it is drawn from the retorts into the wagons on the tramway below, where it is sprinkled, and then pushed out of the house. For carrying off the fumes from the sprinkling of the coke, there are two shafts, extending from the roof of the basement nearly to the lanterns in the roof of the house. Most of the vapors, however, pass up through the openings in the gangways. The drawing of the retorts is accomplished with very little assistance after the check plate has been removed. The pitch which collects at the lower mouthpieces is received in a bucket held for the purpose. This is the only unpleasant operation; and it is one which requires a certain amount of skill.

The charging stages, consisting of ribbed iron plates on an iron framing, stand some 17 feet 8 inches above the floor of the house. The center part is open, and protected by a railing. The retorts are charged according to Riegel's system, in which charging receptacles suspended from a rail are pushed along the front of the benches. Each bench has an overhead coal hopper, holding about 63 tons of coal, for the supply of the 5 beds of retorts. Each of these fixed hoppers is provided with 6 outlets, closed by slides, from which the charging receptacles are filled, and are then pushed along to the retorts. A special charging receptacle is provided for each horizontal tier of retorts. The coal is discharged from them into the retorts quickly and uniformly.

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The bridge and dip pipes are provided with self-closing Didier seals. The wrought iron collecting main has movable supports and Drory outlets and cleansing arrangements. The outlet pipes are 8 inches in diameter, and take both the gas and the condensed products. Each outlet has a special valve by means of which any setting may be shut off. The collecting mains for each bench are nearly 16 inches in diameter. From these the gas passes into four distinct foul mains, which are attached to the main columns of the house. Provision is made at intervals to meet the expansion and contraction of these mains (see Figs. 1 and 2, Plate I.). These four mains divide the working of the house into 4 sections, as is shown by Fig. 5, Plate I. There are two tar mains placed beneath these 4 mains; and they unite in one main, nearly 16 inches in diameter, at the east end of the house. This main leads to the separating tank, which precedes the tar and liquor wells. The 4 gas mains in the retort house gradually increase in diameter from 16 inches to nearly 40 inches, which is their diameter as they emerge from the house at its east end. Here there are vertical connections to underground mains of the same size leading to the condenser house.

[To be Continued.]

Mayer's Improvements in Gasholder Tanks.

In the JOURNAL for the 25th ult., p. 848, was given an abstract of the specifications relating to the application made by Herr Otto Intze to the British Patent Office for protection in respect of improvements made by him in the construction of gasholder tanks. We herewith reproduce the specification of U. S. Letters Patent No. 673,170, dated April 30, 1901, issued to Mr. Frederick J. Mayer, of Baltimore, Md., for "Certain Improvements in Gasholder Tanks." It will be noted that the Mayer and Intze constructions are virtually the same—save that the Mayer tank is not an annular one. The Mayer specification—which was filed December 7, 1900—is as follows:

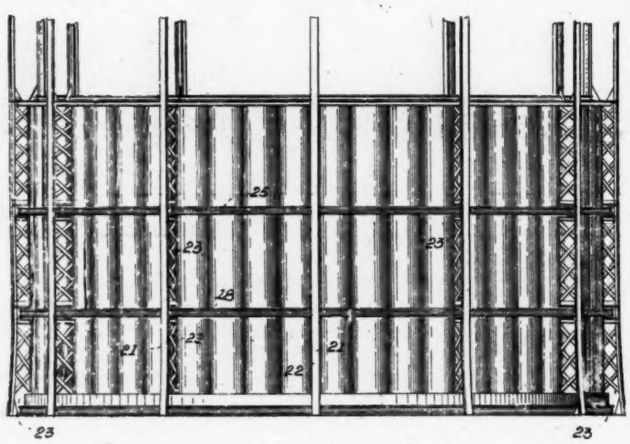
This invention relates, first, to a peculiar construction of a gasholder tank, whereby the necessary tensile strength to resist internal pressure is obtained by reinforcing a comparatively thin shell, rather than depending on the shell alone, thus avoiding the handling and manipulation of heavy plates.

Secondly, to the formation of the tank proper in independent segmental sections, which are built shipped and erected as entireties, and only require to be connected to form a circular body, as will hereinafter fully appear.

In the further description of the said invention which follows reference is made to the accompanying drawings, forming a part hereof, and in which

Figure 1 is an exterior elevation of the improved gasholder tank. Fig.

Fig. 1.



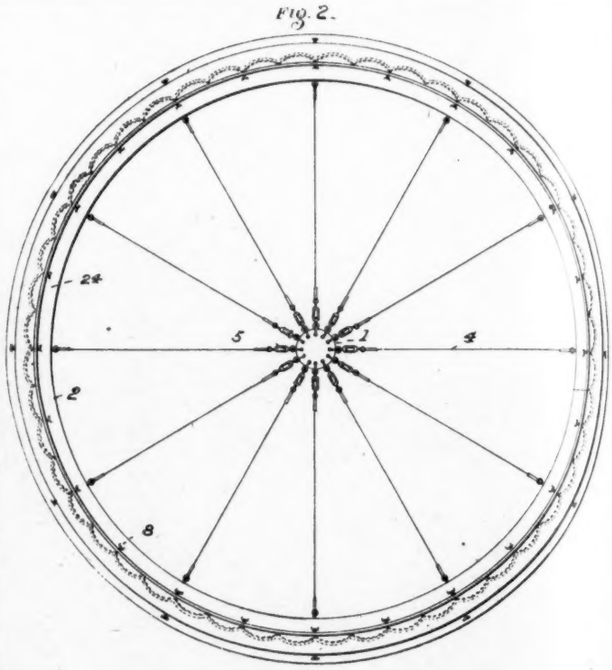
2 is a plan of the same. Fig 3 is an enlarged exterior top view of one of the segmental sections of the tank. Fig. 4 is a section of Fig. 5, taken on the dotted line *A A*. Fig. 5 is an enlarged vertical section of Fig. 4, taken on the dotted line *B B*. Fig. 6 is an end view of Fig. 3, looking in the direction indicated by the arrow. Figs. 7, 8 and 9 are enlarged details of the tank, Figs. 8 and 9 being on a still further enlarged scale. Fig. 10 is a view similar to Fig. 4, illustrating a modification in the construction of the tank.

Referring now to Figs. 1 to 9, inclusive, 1 (see Figs. 2 and 7) is a circular plate, situated at the center of the foundation of the tank, and 2 an annular plate forming a part of the wall of the same. The annular plate 2 has a downwardly extending flange 3, which is connected to the plate 1 by the tie-bolts 4, having the turnbuckles 5. The plates 1 and 2 are seated on the concrete foundation 6, and over them is poured the grouting 7, which forms the floor of the tank.

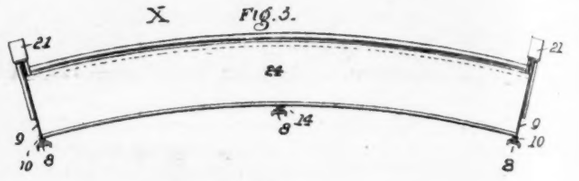
The wall of the tank is formed of segmental sections *X*, each one of which is constructed as an entirety. In the erection of the tank the sections are placed together and their adjoining ends united by rivets, after which the whole is strengthened by a system of wire ropes wound around the structure in a manner hereinafter described. At each end of a section X is a vertical channel iron 8, secured to a vertical plate 9, by means of the angle irons 10 and the necessary rivets. (See particularly Fig. 4.) The channel irons 8, serve as guides for the rollers of the gasholder. (Not shown.)

11 11 are angle irons (see Figs. 4 and 10 particularly) which are bent so as to form a series of segments having a small radius. (See particularly Fig. 4.) At the junction of the small segments are secured the I-beams 13, which extend from the top to the bottom of the tank. Instead of an I-beam at the center of the segmental section X is a plate 14, similar to the ones 9 before referred to, and this plate 14 is provided with a channel iron 8 similar to the others represented by the same

Fig. 2.



X Fig. 3.



B Fig. 4

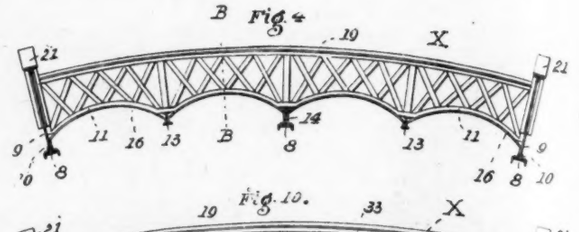
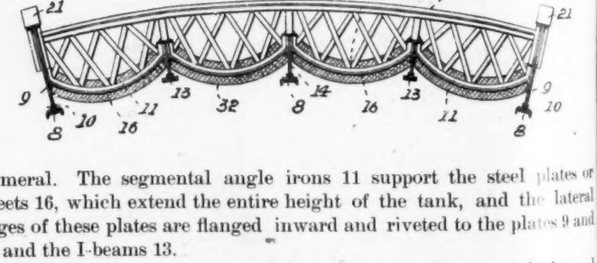


Fig. 10.



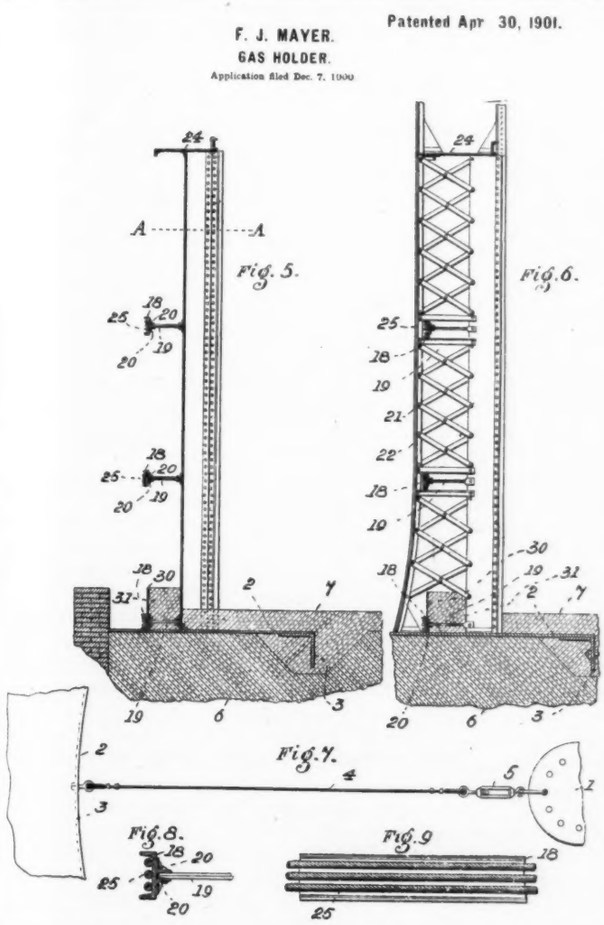
numeral. The segmental angle irons 11 support the steel plates or sheets 16, which extend the entire height of the tank, and the lateral edges of these plates are flanged inward and riveted to the plates 9 and 14 and the I-beams 13.

18 18 (see Figs. 5 and 8) are horizontally placed segmental channel irons situated exteriorally of and at some distance from the inner wall of segmental sheets and secured to the angle irons 11 by the lattice work 19, consisting of crossed flat bars. The said lattice bars are secured to the horizontally placed segmental channel irons 18 by the angle irons 20.

21 21 are standards (see Fig. 6) situated where the segmental sections X adjoin, and they consist each of a flat plate 22, flared out at the bottom, as shown in the figure, and secured to the plates 9 by means of the lattice work 23 and angle irons.

The whole structure thus far described is covered by the head plate 24. (Shown in Figs. 3, 5 and 6.)

Around the annuli formed by the segmental channel irons 18 are tightly wound the steel cables 25 (see particularly Figs. 5, 6, 8 and 9) which bind the whole tank circumferentially, thus reinforcing it and adding to its inherent strength. These cables may be separate and independent of each other, or a single cable may be wound around each annulus and secured, as their office is to increase the tensile strength of the remaining portion of the structure. Within the lower channel iron annulus 18 is placed a circular plate 30, and between this plate and the



segmental plates 16 is a body of grouting, 31 to render the tank water tight at the bottom.

Referring now to Fig. 10, it will be seen that the segmental plates 16 are reversed in position and present to the interior of the tank convex instead of concave surfaces. In this alternative construction the plates are subjected to a compressing instead of a tensile strain, and they are reinforced by interior and exterior coverings of concrete, respectively represented by 32 and 33. In other respects the construction of the tank is the same as that before described.

I claim as my invention:

1. In a gasholder tank, the wall thereof constructed in segmental sections embodying a system of smaller segmental plates, backed by angle irons, a series of annuli situated exteriorly of the said segmental plates, lattice work which unites the annuli with the angle iron backing and cables wound around the said annuli and fastened.

2. In a gasholder tank the inner wall thereof formed of segmental plates of a smaller radius than the wall proper, combined with a backing of angle irons and lattice work, a series of annuli, and cables wound around the said annuli and secured thereat.

3. In a gasholder tank, the wall thereof constructed of a shell, a series of annuli placed one above another exteriorly of the shell, means to connect said annuli to the exterior surface of the shell, and cables wound around the said annuli and secured thereat.

4. In a gasholder tank, the wall thereof embodying a series of segmental plates of a smaller radius than the tank proper, and means applied to the tank exteriorly of the said segments to prevent their circumferential distortion.

5. In a gasholder tank, the wall thereof embodying a series of segmental plates of a smaller radius than the tank proper, and a series of annuli situated exteriorly of the segmental plates, combined with means to unite the said annuli with the segmental plates, and cables wound around the said annuli and secured.

6. In a gasholder tank, the wall thereof formed of a series of segmental plates of a radius which is less than that of the tank proper, provided with a vertical angle iron at each end or edge, whereby the said segmental plates are secured together, combined with a series of annuli, lattice work which connect the said annuli with the angle iron segments, and a cable wound around and secured to each annuli.

Changes in Arc Lightiag.

[By Mr. Alton D. Adams, in *Elec. World and Engineer.*]

Arc lighting for streets and private service is now done by not less than seven distinct varieties of lamps. Five of these varieties operating with direct current are single open series arc, single open multiple arcs, single inclosed series arcs, single inclosed multiple arcs, and double open series arcs. Alternating currents operate single inclosed series arcs, and single inclosed multiple arcs. As to the costs of operation and methods of distribution these lamps differ widely. Because of this some of the varieties have largely displaced others in the past, and like changes are still going on. Single open arcs, distributed by series circuits from constant, direct current dynamos were the first to enter the lighting field, a little more than two decades ago. This type of lamp usually operates with current of 6 to 10 amperes, according to the degree of illumination desired, and 45 to 50 volts at the arc. A very large per cent. of the energy delivered to these lamps is available at the arcs, as the coils of the regulating magnets consume only trifling amounts. In most instances it has not been found desirable to increase the pressure of series or circuits beyond about 3,500 volts, thus providing for approximately 60 open arcs and a considerable line loss. The pressure last named with 10 amperes flowing represents only 35,000 watts, which is thus a common limit to the individual capacity of arc dynamos. Such a limit is exceeded in some cases by operating more lamps per circuit, or by the construction of dynamos intended to operate several independent circuits each.

Street lighting has been a very large part of arc lamp service from its inception, and the expense of operation for single open arcs is especially heavy for this line of work. During a large part of each year street lighting must be done for 10 to 12 hours per night. As a single pair of carbons is consumed in 6 to 8 hours of operation, the single open arc must usually be trimmed during the night for street service. The use of double instead of single open arcs for streets saves fully one-half the labor of trimming, because much more time is required to go to each lamp than to fix the carbons when there, and the work cannot be done as rapidly at night when there is energy on the line, as during the daytime when the circuits are dead. For commercial service the advantage of double over single open arcs is much less, because such service seldom requires more than one pair of carbons per lamp per night, and a trimmer must usually make the rounds daily in any event. While arcs on series circuits are available for both street and commercial service, they are especially adapted to the former, because of the ease with which they may be distributed over wide areas. On the other hand, arcs in multiple are subject to the limits of low pressure circuits, but may be operated from the same supply with incandescent lamps, and are thus well suited to the requirements of commercial service. As multiple arcs of either the direct or alternating type may be operated by large generators that also supply incandescent lamps and motors, they are a much more desirable load than series arcs. With multiple arcs 15 to 25 per cent. of the energy taken from supply lines must be expended in resistances connected with each lamp because of the pressures at which incandescent lamps and motors are operated. Such resistances must in any event consume 10 to 15 per cent. of the energy delivered for multiple arcs, in order to insure steady working of the lamps.

The most important differences between open and inclosed arcs, whether of the alternating or direct current variety, are the increased voltage of the latter and their longer service with a single pair of carbons. Inclosed arcs require 75 to 95 volts between the carbon points of each lamp, or nearly twice the pressure necessary for the open variety. One pair of carbons in the inclosed arc lamp lasts roughly 15 times as long as in an open arc. For distribution on series circuits the higher voltage of inclosed arcs is a decided disadvantage, because little more than one-half as many lamps can be operated on a single circuit as that possible with open arcs. On the other hand, the higher voltage of inclosed arcs is often an advantage where they are operated on circuits of constant pressure, because a single lamp can be supplied from 110-volt mains with much greater economy than is possible with open arcs. The great advantage of inclosed arcs that more than offsets any disadvantage they may have is the saving which they effect in the cost of carbons and labor for trimming.

The several classes of arc lamps have come upon the scene one after another, and the effect of each type in displacing previous sorts has been due much more to possible economies of operation than to capacities for superior service, though this latter has not been lacking.

With the qualities of the several classes of arc lamps in mind it is possible to detect the reasons that have determined the numbers of each type in use for streets and commercial purposes since the inception of the

industry. Beginning with 1888, the number of each kind of arc lamps operated by electric lighting stations in Massachusetts has been recorded for each fiscal year in the public records of that State, and the figures here presented are derived from this source. From the table it appears that the total number of arc lamps supplied from lighting stations has constantly increased for each of the 12 years from 1888 to 1900. In the former year the number operated was 6,579, and in 1900, 23,355, a gain of 255 per cent. Commercial arcs have fallen behind the rate of gain made by the total for all purposes, their number having been 3,258 in 1888, and 9,893 in 1900, an increase of 200 per cent. for the period.

Arc Lamps Operated by Electric Stations.

Year Ending June 30.	Total Arc Lamps.	Commercial Arc Lamps.	Arc Street Lamps.
1888	6,579	3,258	3,321
1889	8,827	3,928	4,899
1890	9,999	4,492	5,507
1891	11,868	5,004	6,864
1892	14,097	5,600	8,497
1893	15,583	5,846	9,737
1894	16,602	6,593	10,009
1895	17,313	6,653	10,660
1896	18,714	7,614	11,100
1897	19,529	7,834	11,695
1898	19,847	7,743	12,104
1899	21,253	8,161	13,092
1900	23,355	9,893	13,462

Arc street lamps, on the other hand, have increased in numbers at a greater rate than the total for all purposes, having stood at 3,321 in 1888 and at 13,462 in 1900, a gain of more than 300 per cent.

For each year the number of arc street lamps has been divided by the total number of arc lamps to determine the per cent. in street service.

Year Ending June 30.	Per Cent. Street Lamps.	Year Ending June 30.	Per Cent. Street Lamps.
1888	50.4	1895	61.5
1889	55.5	1896	58.8
1890	55.0	1897	59.8
1891	57.8	1898	60.9
1892	60.2	1899	61.6
1893	62.4	1900	57.9
1894	60.2		

From these results it appears that the per cent. of street lamps to the total arcs in use increased from 50.4 in 1888 to 61.6 in 1899. During these 11 years the rise in the proportion of street lamps suffered two checks—one in 1894 and another in 1896.

From 1899 to 1900 the relative number of street arcs fell rapidly and stood 57.9 per cent. in the latter year. Before the reasons for these changes can be traced, the number of each type of lamp operated in different years must be considered. The table presents the numbers of single and double open and of inclosed arcs in use each year, for both street lighting and commercial purposes.

The single open arcs present a striking illustration of rise and decline. Starting with 4,392 in 1888, the number of this type of lamp reached 7,056 in 1893, was at 7,485 in 1898, and dropped to 2,915 by 1900.

Types of Arc Lamps Operated by Electric Stations.

Year Ending June 30.	Single Open Arcs.	Double Open Arcs.	Inclosed Arcs.
1888	4,392	2,187	....
1889	5,452	3,375	....
1890	5,364	4,635	....
1891	5,753	6,115	....
1892	6,574	7,523	....
1893	7,056	8,527	....
1894	7,286	9,316	....
1895	6,929	10,384	....
1896	7,159	11,555	....
1897	7,385	12,144	....
1898	7,485	12,362	....
1899	5,096	11,857	4,300
1900	2,915	8,452	11,988

For the year of 1888 the number of double was less than the number of single open arcs, because the former came into the market later. The rise of the double arcs was the more rapid and the maximum number greater, but attained in the same year as that of the single open arcs. In 1888 the double arcs numbered 2,187, and the maximum of 12,362 was reached in 1898. After this later year the number of double arcs declined, though not as rapidly as the single type, and stood at 8,452 in 1900. Inclosed arcs began to be used about 1897, but their numbers do not appear in the records until 1899, when the total was 4,300. By 1900 this total had more than doubled, and stood at 11,988 in that year.

Increase in the Number of Arc Lamps for Each Year.

Year Ending June 30.	Commercial Arc Lamps.	Arc Street Lamps.	Single Open Arc Lamps.	Double Open Arc Lamps.
1889	670	1,578	1,060	1,188
1890	564	608	*88	1,260
1891	512	1,357	389	1,480
1892	596	1,633	821	1,408
1893	246	1,240	482	1,004
1894	747	272	230	789
1895	60	651	*357	1,068
1896	961	440	230	1,171
1897	220	595	226	589
1898	*91	409	100	218
1899	418	988	*2,389	*505
1900	1,732	370	*2,181	*3,405

*Decrease.

To bring out more clearly the reasons for the increase or decrease in the number of each type of lamp, the additions to commercial, street, single open and double open arc lamps are given in the table for each year. From 1888 to 1898 the number of commercial arcs increased 4,485, but during the same period only 3,093 single arcs were put into use, so that 1,392 double arcs must have been required for commercial purposes, even if no single arcs were used in the streets. During the decade just considered 8,783 street lamps were put into operation throughout the State, and the number of double arcs added for all purposes was 10,175. This leaves an excess of 1,392 double arcs above the requirements for street lamps, or just enough to make up the difference between the numbers of commercial and of single arc lamps. As a matter of fact, while the demands of street lighting were mainly supplied by double arcs, it is probable that a few of the single lamps were used for this purpose. In only 4 years, between 1889 and 1900, was the number of single open arcs put into operation sufficient to meet the demands of commercial service. The largest additions of single arcs during this period were made from 1891 to 1897, when single multiple arcs were being applied rapidly to commercial service. The figures for the yearly increase of arc lamps show only the net additions. The decade from 1890 to 1900 saw a large displacement of series by multiple open arcs in commercial service, but this movement is not indicated in the table.

In each of five years between 1889 and 1897 the addition of double arcs was greater than the requirements for street lighting, and in the three years, where demands for street lamps exceeded the additions of double arcs, these excesses were relatively small. The year 1898 saw a great decline in the addition to the numbers of both single and double open arcs, less than one-half of the usual number of the former and less than one-quarter of the usual number of the latter being put into service during the year. For each year up to and including that last named the sum of street and commercial arc lamps is just equal to the sum of single and double open arcs, because the number of street lamps in each case is found by the subtraction of the number of commercial lamps from the sum of single and double open arcs. It is possible that the numbers of street lamps for the years 1897 and 1898 are less than they should be, because the State reports do not show the numbers of inclosed arcs separately for these years, and it is not clear that they were included in the numbers of open arcs.

The year 1899 evidently marks a new era in the applications of arc lighting. For that year there was an increase of 1,406 in the total number of arc lamps used for all purposes, and at the same time the open arc lamp declined by 2,894. The demand for increased service, as well as the falling off of the single and double open lamps, was met by an addition of 4,300 inclosed arcs. Changes for the year of 1900 were even more radical than those just described. In this year the arc lamps added for street lighting and commercial service numbered 2,102, while the decrease of single and double open arcs was 5,586. Inclosed arcs to the number of 7,688 were put into service meantime to replace the open arcs thrown out of use and meet the new demand. During the two fiscal years just considered, 4,570 single and 3,910 double open lamps were replaced by inclosed arcs. In the absence of any other reasonable cause it seems certain that the inclosed arcs have largely increased the demand for arc lighting. During the four years from 1894 to 1898 the number of arc lamps in use for all purposes increased by 3,245, but in the two years from 1898 to 1900 the like increase was 3,508 arc lamps, making the yearly rate twice as great on an average in the later as in the earlier

eriod. For the year of 1900 the number of arc lamps in use for all purposes increased by 2,102, a number equaled by additions in previous years only by those for 1889 and 1892. In these two earlier years street lighting was making rapid advances by means of double arcs, and more than 70 per cent. of the lamps added in each year were devoted to this purpose. On the other hand, for 1899 and 1900, only 38 per cent. of the added arcs were street lamps. From this it seems that the especial influence of inclosed arcs has been to stimulate commercial service. Six years between 1892 and 1898 saw an increase of 2,143 in the number of commercial arc lamps, and the two following years gave a further increase of 2,150 arcs in the same service. Evidently the inclosed arc stands a much better chance than the open type in competition with incandescent lamps for interior illumination.

The substitution of inclosed for open arcs has a strong tendency to modify distribution lines and generating stations. With inclosed arcs the number of series lines may be double, or the maximum voltage of each line be twice that necessary for an equal number of open arcs. This makes it more desirable to supply street as well as commercial arcs from constant pressure circuits wherever possible than was the case with open arcs. In the supply of private consumers the change from open arcs on series circuits to inclosed arcs on constant pressure circuits is far advanced. Even where series distribution is retained for inclosed arcs in street service, there is a tendency to shift them from direct to alternating current. This tendency is stronger with the inclosed than with open arcs, because the illumination from the former is satisfactory, where the alternating current is used. The movement of arcs from series to multiple circuits, and from constant direct to constant alternating current lines retarded the increase in capacity of constant current dynamos throughout the decade from 1890 to 1900. Exact figures cannot be given on this point, but it is a matter of general knowledge that multiple have largely displaced series arcs in commercial service, and the per cent. of arc street lamps to the total reached its highest point at 62.4 in 1893. For the year of 1900 the total capacity of arc dynamos throughout the stations of the State declined 193 kilowatts. Of the 4,300 inclosed arcs reported for 1899, 3,313 were in use at Boston, leaving 987 for the remainder of the State. In 1900 the number of these lamps at Boston was 6,682, and the rest of the State had 5,304. Thus while the inclosed arcs in use at Boston were doubled in number, those outside were multiplied by 6.

The Compressive Strength of Masonry.

Engineering Record says that although masonry is the oldest of the materials employed in engineering construction, it is probably that of which engineers possess the least certain information as regards carrying capacity. This is due to a number of reasons. The processes by which either iron or steel are produced in any of their many grades are under accurate control, so that the quality of the finished product is predetermined within very narrow limits. This is true not only of the chemical composition of the structural metals used by the engineer, but also of their physical properties.

The case is altogether different with even the best of the natural stones used by civil engineers, and almost equally true of the artificial stones. Both granite and limestone of the best grades are exceedingly variable in their physical resisting qualities as well as in their texture and frequently in their chemical composition. For this condition of things there is no help. Uncontrolled heat and other geologic agencies have been active in the formation of the natural ledges of granite, limestone, sandstone and other rocks available for structural purposes, with a range of results so wide that probably by far the larger portions of any rock nominally available must be considered waste, or, at any rate unsuitable for structural purposes.

The case for artificial stones is somewhat better, but they are by no means entirely free from the same class of defects. Probably bricks and certain special artificial stones comparatively costly to produce reach nearer to a true uniformity of quality than other artificial masonry material; but even they are far enough from being ideal in uniformity of physical characteristics. When the best of concretes are considered, the uncertainties attached to the results of mixing and putting in place certainly lead to a wide range of ultimate resistances.

All these facts do not militate against the possession by the engineer of materials of great structural value in both natural and artificial stones, but it must be admitted that the ideal uniformity of quality in masonry has not yet been attained. Hence, the results of all careful investigations as to elastic properties, ultimate resistances or rates of thermal changes of dimensions for either natural or artificial stones or masonry constitute a distinct addition of value to the technical knowledge of civil engineers. The admirable reports of the "Tests of Metals and other Materials for Industrial Purposes," issued annually by the Secretary of War, contain data of the desired character and have added largely to the engineer's knowledge of the compressive and other resistances of masonry, but much yet remains to be done. A valuable series of similar investigations has been undertaken by the Austrian Society of Engineers and Architects through a committee appointed for the purpose, an account of which, so far as completed, was printed in the *Engineering Record* of November 23. By referring to that issue it will be observed that the materials employed in the tests were granite, hard sandstone, concrete and brick masonry, the joints being filled with Portland cement mortar of the proportions, 1 cement to 2 sand and 1 cement to 3½ sand. The phenomena attending the failure of both the granite and sandstone blocks and those of masonry were naturally essentially identical with those exhibited in corresponding tests at Watertown, Mass., among others, chipping or flaking of the material, longitudinal cracks appearing at incipient failure and conical shaped fractured portions of the test pieces.

The first feature arresting the attention of the American engineer is the ultimate resistance of the 12-inch granite cubes, ranging from 8,550 to 10,910 pounds per square inch; whereas the ultimate resistance of American granite employed for engineering structures may generally be expected to run from 14,000 to 20,000 pounds per square inch. It is stated that these granite cubes showed "very coarse fractures," hence it is probable that the quality of the stone was not of the best. Sandstone is an exceedingly variable material, but the values exhibited by the Austrian tests are well within the limits of ultimate resistance of the "hard sandstone" of this country.

Among the most interesting results are those belonging to concrete and concrete-steel blocks. There are few details as to the fabrication of the concrete specimens, but it is difficult to understand why concrete as rich as 1 cement, 2 sand and 3 broken stone should not have given higher results than 1,780 and 1,850 pounds per square inch at the age of three and one-half months. Indeed, all the results for the concrete are lower than tests of similar material at the Watertown Arsenal have shown. Again, while the paving brick masonry tests exhibit excellent results those belonging to the common brick masonry seem rather low, even for the age of three and a half months.

As in tests of all such material the ultimate resistances vary with the character of the mortar, although it is stated that the "mortar in the joints could not be crushed;" and, further, that the strength of the masonry was not determined exclusively by that of either of the constituents. This, however, is not so clear. The tests at the Watertown Arsenal have shown conclusively that a weak mortar, such as one of lime, reduces greatly the ultimate resistance of the masonry in a considerably larger number of tests than those made by the Austrian committee. A close scrutiny of the latter does not appear to contradict that conclusion, although the tests are too few in number to give clear definition to any conclusions whatever. A weak mortar does not necessarily induce failure of masonry wholly by its own crushing, but partially by yielding in spots so as to fail to afford support in such places and thus permit more or less failure of the stones or brick in detail. The real effects of strong and weak mortar can only be clearly exhibited by making the contrasts sharp; that is, by testing masonry specimens in which there is a great difference in the mortars employed.

The great enhancement of strength produced by steel imbedded in concrete is admirably brought out in the tests of the concrete steel prisms. The presence of the metal adds strikingly to the ultimate resistance and shows that the combined material is worthy of all the confidence placed in it. It is a serious question, however, whether in these cases higher results would not have been attained if the steel rods parallel to the direction of loading had been a little too short to touch the bearing faces of the testing machine.

Distribution of Electricity in Cities of Moderate Size.

[By Mr. William Lispenard Robb.[1]]

In dealing with the question of the distribution of electricity it is impossible to lay down any but very general principles that will apply to many actual cases. Each individual case will be governed largely by existing local conditions. Much that would be desirable if a plant were being laid out new is found impracticable when the conditions of an existing plant are taken into account.

Cities naturally divide themselves into groups according to population, and for the purposes of this paper I have considered "cities of moderate size" as including those having a population of 200,000 or

1. Trans Am. Inst Elec. Engineers.

less. A satisfactory solution of the problem of electrical distribution is manifestly different in cities of this class from that in the large metropolitan cities.

Indeed, in dealing with the problem in cities of moderate size, a system of distribution that would be satisfactory for the smaller cities of the class would not meet all the requirements of the larger cities. No exact limitation can be placed as to the point at which the requirements materially change as they are largely governed by local conditions other than population. It seems to me, however, that cities having less than about 50,000 inhabitants make a class by themselves.

In cities of less than 50,000 inhabitants a very considerable area has to be lighted, in general extending out from two to three miles in all directions from the central station. In a considerable portion of the city electricity will be required only for street lighting. Then 50 to 100 miles of street will have to be lighted, and arc lighting will generally be required for this service. It will be necessary to supply electricity for incandescent and arc lighting and power wherever desired. In general, in the cities of this class there will be practically no tendency to put in isolated plants. There will be found little, if any, objection to overhead wires. If any wires should be required to be placed under ground it will only be in a very limited section of the city, and the total amount of electrical energy supplied from the underground wires would be small. The commercial lighting and power in a city of this class would not be concentrated but scattered over several square miles. The demand for variable speed motors would be too small to be taken into account. The total amount of electrical energy would be too small to warrant the maintainance of more than a single station.

Under all these conditions it seems to me that only 3-phase alternating current, having a frequency of 60 cycles and under a pressure of about 2,300 volts should be generated.

The street arc lighting should be by constant current series inclosed arc lamps. The distribution for lighting would in general be single-phase, and if motors of 3-horse power or under, only, were used, it would be best to operate the motors from the single-phase lighting system. My own experience has been that single-phase motors above this size are not satisfactory as compared with polyphase motors, and will not meet all the requirements. Any city central station should be cap able of supplying power for any purpose, and should be able to supply current for electrolytic and storage battery work. When the motors required are large, 3-phase motors should be used, and 3-phase rotary converters installed on the customer's premises should be used for electrolytic purposes.

The city should be divided into sections, and the different sections supplied from the different phases. If at any one point in any section large motors or rotary converters are required the additional primary wire would be brought from the nearest point in the adjoining sections. Satisfactory service will be given with light and motors supplied from the same circuits.

In sections where there is any concentration of lighting and power a 220-volt 3-wire system of secondary wiring should be used, and be supplied if the system is small from a single transformer, or if the system is large, from transformers suitably located at several points. I do not think it would be found desirable in practice to cut out any of these transformers during the hours of light load.

In the larger of the cities of moderate size a different set of conditions exist, and the problem of electric distribution is very materially modified. The area lighted is very large, and while commercial lighting and power are concentrated in sections, lighting and power service has to be supplied in practically all parts of the city. There is a tendency for the department stores, office buildings and large manufacturing industries to put in their own electric plants, and there is a growing demand for the wires in the business section to be put underground.

In cities of this class there are generally two sections where the demand for electricity is concentrated—the business section where are located the large stores and office buildings and the manufacturing district. Each of these sections has its own characteristics. In the business district the use of the large motor is largely confined to elevator and other service where the load is exceedingly variable and intermittent, and at the same time the very best lighting service is insisted upon, both as regards the constancy of the lights and the absolute certainty of the service. As a rule, in the manufacturing district the percentage variation in load on the motor service is very much less than in the business section, the only variation that seriously affects the lights occurring when the machinery is started in the morning and after the noon hour. At these times there is practically no lighting. While the demand that the wires in the business section should be placed underground must be heeded, there is practically no demand for it in manufacturing districts.

The central station should be located at a point where coal can be delivered directly from the boat or railroad, and where water for condensing can be readily obtained. In nearly all places this means that the generating station will be situated a considerable distance from the business section of the city. The conditions existing in the business section of a city of this class, as against the concentration of load, the intermittent character of the motor load, the necessity and desirability of underground wires, the existing investment of central station and customers in direct current apparatus, isolated plants and the relatively high price charged at present for alternating currents and arc lamps, motors, etc., make it desirable to supply the business section at the present time with direct current.

Considering that it is desirable to supply both commercial, incandescent and arc lighting, and also motors from the same system of wiring, it seems best that the current should be distributed on the 3-wire 220-volt system. This voltage is preferable to a 440-volt system, as in my opinion the saving in copper required for the distribution, if the higher voltage is used, is much more than counterbalanced by the inferiority of the 220-volt arc and incandescent lamps as compared with the corresponding 110-volt lamps.

In general, the situation of the power house most suitable for the cheap production of electricity will not be in the business district. The needs of a city of moderate size would also not justify the operation of two power houses. The electricity for the business district should be, therefore, in general supplied from a rotary converter sub-station, situated as near as possible to the center of distribution of the business district.

The main power house should generate only alternating current. This should have a frequency of 60 cycles, be a 3-phase 4-wire system, and have a pressure of approximately 2,300 volts between each phase wire and the common wire. The 4-wire 3-phase system is preferred, owing to the saving of copper, over other systems that would prevent the using of standard 2,300-volt transformers and other standard line materials. Sixty cycles should be used, as arc lamp motors, incandescent lamps and rotary converters for supplying the 220-volt direct current can all be operated satisfactorily at this frequency, and at no other frequency at which generators are now made commercially.

The electricity from the power house to the rotary sub-station should be transmitted on the three 3-phase wires, the common fourth wire being omitted. Boosters would not be required, and the pressure in the d.c. side of the rotaries would be varied by means of the static transformers used in connection with the rotaries.

The direct current distribution from the sub-station should be underground. Not only is this demanded by the public, but in the business section of the cities, I believe that interest or investment cost of maintenance taken into account, it is decidedly cheaper as well as much more satisfactory to maintain an underground than an overhead system of distribution.

The feeders should be lead covered cables drawn into conduits, as feeders are liable to have for short periods considerable overloads, and there are no branches to be tapped off. I believe paper insulation is more satisfactory as well as cheaper for feeders than rubber.

The distribution boxes should be of the manhole type, or better still, of the lamp post type. The old style of Edison box blocks traffic too much to be installed at the present time.

When frequent services have to be made there is nothing so satisfactory as the old Edison tubes. When the services are infrequent the most satisfactory system is to use lead covered rubber insulated cable drawn in ducts as distributing mains, carrying a single service into each building, from a small distributing box placed at every other property line. Arc lighting, incandescent lighting and power should all be supplied from the same system of distribution.

Outside of the business section the electricity should be supplied for all purposes on the alternating current system. The current should be taken to the power house from various distributing centers on the 4-wire 3-phase system. From these centers of distribution single phase circuits should be run for the operation of commercial arc and incandescent lighting and small motors. Additional phase wires would have to be taken from the centers of distribution to manufacturing plants where large motors were used.

When the lighting is at all concentrated, the lighting and motors should be supplied from 3-wire 220-volt secondary mains, fed by large transformers, and it will be found desirable to thoroughly ground the neutral wire.

The street lighting should be by series constant current arc lamps. In some cases it would be desirable to supply the current for these from transforming devices located at the central power house. In other cases the transforming devices could be most advantageously located at

the centers of alternating current distribution, as thereby the number of wires could be materially reduced, a few large wires taking the place of a very much larger number of small wires.

In order that a system of alternating current distribution of any size should be satisfactory, it is necessary that the arrangement of the power house be such that current be supplied to the different feeders at different pressures. This can be done by boosting transformers in each feeder circuit, and by a system of pressure wires brought back to the power house from the various centers of distribution, or by the automatic device of Mr. W. L. R. Emmet.

The successful introduction of the Nernst lamp into the fields of incandescent and arc lighting, and the development of the steam turbine should have a marked effect in favor of the generating and distribution of alternating current. On the other hand, the air is full of rumors of marked improvements in storage batteries.

Competitive Tests of Steam Pipe Coverings.

Engineering News says that tests of steam pipe coverings have been carried on for the last six weeks at the new power house of the Manhattan Elevated Ry., at 75th street and East River, by Mr. Geo. H. Barrus, M. Am. Soc. M.E., of Boston. The tests are arranged on a large scale, and extend over periods varying from one week to six weeks, so that the results may be taken to be quite reliable. The full series of tests is not yet completed. On Tuesday, Oct. 12, a number of prominent engineers inspected the test apparatus on the invitation of Mr. Barrus, who read a few explanatory remarks on the method of conducting the test.

Steam pipe coverings in this test are arranged in three different classes: (1) 2-inch coverings (for 2-inch standard pipe) for low pressure steam, (2) 2-inch coverings for high pressure steam, (3) 10-inch coverings for high pressure steam. Each style of covering tested is applied in a thorough manner to a certain length of pipe, and a certain pressure of carefully dried steam is maintained in the pipe by supply from a header at one end; the other end is fitted with a small steam cock, in the pipe itself, and a water-leg below fitted with gauge glass and water cocks.

A slight outflow of steam through the pet cock, amounting to about ¼-horse power for each length of pipe in the test, insures a practically uniform temperature within the pipe. The water condensed in the pipe drains to the water-leg, whence it is discharged at intervals into a weighing cask below. The amount condensed during a measured time interval, as nearly as may be eight hours per day, is weighed in this manner, and the hour average of many days' test taken as an index of the rate of loss of heat from the covering.

Coverings of class 1 mentioned above are tested each on 100 feet in length of 2-inch pipe, the constant steam pressure being 80 pounds. Five such lengths of pipe permit of simultaneous tests of five coverings.

Class 2 is similarly tested on 100 feet of 2-inch pipe with a steam pressure of 150 pounds; five pipes are tested at once. Class 3 is tested on 50 feet of 10-inch pipe, only two such pipes being set up for test. In class 1 four pipes are used for continuous long time test; on the fifth pipe all the coverings are tested successively for shorter periods of time, so as to determine whether differences in pipes themselves and in application of coverings cause any errors to creep in.

The coverings were bought in the open market. After each covering was applied, the makers were asked to examine it and remedy any errors or deficiencies in its application. Temperatures of steam, air and water, pressure of steam, moisture in atmosphere, etc., are carefully measured, and the existence of air currents is frequently tested for in order to avoid any chance vitiation of results.

The series of tests is not yet completed, as stated above, and the results that have been obtained to date have not yet been reduced to final form. The amount of water condensed in each length of pipe per hour (with an air temperature of 55° to 60° F.) has been, however, approximately determined. The figures obtained show that the different coverings vary but slightly in efficiency. In class 1 the condensation is 13.5 to 15.1 pounds per hour; in class 2, 10.5 to 13.8; in class 3, 10.7 to 13.9; the figures given are the extremes of condensation in each class. The differences between different coverings are, however, fairly regular, and have been determined with little probable error. Roughly, the order of efficiency is as given in the following table, which Mr. Barrus gave out on the occasion referred to:

Class 1.	Class 2.	Class 3.
(1) John's Asbestocel.	(1) John's asbesto-sponge hair felt, 3-ply.	(1) John's asbesto-sponge felted.
(2) N. Y. air cell.	(2) John's asbesto-sponge hair felt, 2-ply.	(2) K. & M. magnesia (85 p. ct. magnesium carbonate).
(3) Carey's molded.	(3) John's asbesto-sponge felted (sectional).	(3) Asbestos fire felt, Navy brand.
(4) John's molded.	(4) K. & M. magnesia (85 p. ct. magnesium carbonate).	(4) Watson's Imperial.
(5) Gast's Ambler air cell.	(5) Asbestos fire felt, Navy brand.	

In arranging the coverings in the above order, efficiencies only were taken into account. No differences in thickness of covering, cost, durability, etc., were considered.

Argument of Mr. S. S. Rubira, President of the Mobile (Ala.) Gas Light and Coke Company, before the City Council, Respecting the Proposition for an Opposition Gas Franchise.

To the members of the General Council, Mobile, Ala.—Gentlemen: I will not discuss the question of introducing here such a gas plant as this ordinance proposes, limited to serve only one part of the city. The proposition is so absurd that its kind has never in my knowledge been given consideration by any city in the United States, even by such as have been without any supply of gas.

I will take up the matter on the basis of competition, supposing that the competing plant covers at least as large a territory and attends to as many necessities as the plant we already have. It would have to do more than that in order to be of any benefit at all.

It is just as clear as two and two make four that the building of two plants in any city to do the same service that one plant can do is a waste of money that, if it is to be compensated at all, has to come from the pockets of the citizens. I have already explained in my address before your committee how the competition is only temporary, ending always in an arrangement of some kind, or absorption of one plant by the other. But you might say that competition brings down prices. Petitioner has acknowledged before your committee, and in a communication to your honorable body, that one plant can manufacture gas cheaper than two. If it is so, and it cannot be denied, two plants cannot sell gas as cheap as one. But this petitioner said in said communication to you that, while that is undoubtedly true, we are not offering gas cheaper, and that it is a self-evident fact that we will maintain prices at as high a rate as we can as long as we have a monopoly. We have shown by our record that we have been lowering prices at the rate of 10 cents per 1,000 cubic feet per year, or $1.50 in 14 years. We have never raised our prices. It is natural to infer, and we may say it is an absolute certainty, that we shall be reducing the price at the same or greater rate, and that gas in this city will be sold in a few years at less than $1 per 1,000 feet.

This is the almost absolute certainty before you, judging from what we have done before. What is the promise made by the applicant for this franchise, in the very ordinance that he is proposing to you? He offers you gas at a slight reduction from the price that is ruling now all over the city, for only a smaller part of it, and that to be accomplished in not less than over 3 years from date; and as to the future he says, in Sec. 8 of the ordinance, "Be it further ordained that this ordinance shall not take effect until the said J. H. Wilson, his associates, successors or assigns shall execute an agreement in proper legal form, and file the same with the city clerk, providing that if said J. H. Wilson, his associates, successors, or assigns, shall ever buy or otherwise control or operate or consolidate with the Mobile Gas Light and Coke Company or any other company, then, and in that event, the rates fixed in this ordinance shall not be exceeded by said Mobile Gas Light and Coke Company, or by any other company, so bought or otherwise controlled, consolidated with, or operated by said J. H. Wilson, his associates, successors and assigns." Can you have any better proof of the assertion made that one plant will sell gas cheaper than two plants will? With our plant only you are reasonably certain, from the experience you already have, that the price in a few years will be $1 or less, while, with the two plants, you are almost assured that the price of $1.60, fixed

in this ordinance, will be a permanent fixture during the life of the franchise—55 years.

Petitioner states to you in his said communication that he "Proposes to erect a first-class, modern gas plant, where the leakage will be reduced to a minimum, and not only will the citizens receive the benefit of cheaper gas, but it is reasonable to expect that they will get better gas that can be supplied through the ancient mains now supplying consumers with their gas." In his communication to you of August 3d., presenting the ordinance, which has been now substituted while in the hands of the committee by the ordinance before you, he offers, assuming to be in the control of our plant, to furnish gas all over the city. He now proposes to limit himself to part of the city only. It is evident that the gas that he so liberally offered to supply to you then was to flow through the mains that he now calls ancient. As to your being furnished with a better gas than you are now having, we have yet to learn that the age of the pipe through which the gas is distributed improves or impairs its quality. Such representations as this need hardly any refutation!

But petitioner clearly offers to repair the streets after laying his mains and services. That is a work that is generally recognized to be the duty of every company owning a plant of that kind. It is well known, however, that after the streets have been restored and accepted as in perfect condition, settlement takes place after a while, and such imperfection of the streets cannot be traced to any particular company, and such repair has to be done by the city. It is the extra cost of such repairs that was estimated at a sum of $2,000 a year by a former member of your Council, a recognized authority on the subject. It will cost you more after the streets are paved.

The offer of 1 per cent. of his gross receipts, even if he were to get one-half of the consumption of his privileged locality, would not cover one-tenth of the extra cost of street repairs owing to an additional plant. Think, besides, of the benefit that the citizens would have by the gradual reduction of our prices, which soon would go far below the price proposed by this applicant.

It is an undeniable fact that the addition of any gas plant in this city will in the end result in higher prices for gas, and that consequently the granting of this franchise cannot be to the city's interest.

The matter, gentlemen, deserves careful study. It is of too serious nature not to give it due consideration.

Cost of and Benefits from Membership in Engineering Societies.

This editorial matter, from a recent issue of *Engineering News*, is worth close study by many who are interested in our Associations of gas engineers:

The proposed increase in annual dues in the American Society of Mechanical Engineers was discussed in an editorial in our issue of October 3, and has been the subject of several communications since published in our department of "Letters to the Editor." For the most part, however, this discussion has proceeded on the basis that the increase in dues was to be made for the purpose of building a new and larger house for the society in New York city. But by an official circular issued to the members just after the appearance of our editorial it appears that this is not the case at all. Instead, to quote from the circular:

Either the expenditure of the society must be curtailed in directions which would be followed by a corresponding loss of efficiency and of the return to each member, or the dues paid by each member must be raised, to provide a fund from which present indebtedness may be paid, any unusual demand may be met, or any unusual opportunity be availed of.

To learn that an increase of dues was deemed necessary to meet the ordinary running expenses of the society has been a surprise, we are sure, to practically the entire membership. It was known in a general way that the growth of the society had been a steady and gratifying one, the number of members having practically doubled during the past 10 years. During this period, also, the society has paid $32,000 of the debt on the society house, or, in other words, it has had an average surplus of income over expenditures of over $3,000 per annum. With this record of past experience, and remembering that the total income of the society, by the last annual report of the council, is in the neighborhood of $42,500 per annum, the members had every reason to suppose the society to be in a highly prosperous financial condition, and more likely to announce a reduction in the annual tax assessed upon the members than an increase.

What is the reason why the society which got along comfortably 10 years ago on an income of $18,000 now confesses itself financially cramped with an income of over $42,000? That is the question which the average member asks, and he finds no satisfactory answer to it in the circular issued by the Secretary, referred to above. Some figures concerning expenses which are given in that circular, however, are worth analyzing a little.

It appears that the entire cost to the society of publishing its "Transactions," including printing, engraving, binding, pamphlet copies of the papers and all other direct expenditures on the publication, amounted last year to $6.18 per volume. In the same year the actual total expenses of the society amounted to $20.81 per member. In other words, for every dollar spent by the society on its publication, 2⅓ dollars were spent in maintaining its headquarters, in salaries and in other expenses in connection with the conduct of the organization.

If, then, it is decided that expenditures must somewhere be curtailed, it is self evident that much the larger opportunity exists in the indirect expenses of the society. In view of its successful conduct on a much smaller income in the past, it ought to be quite possible to reduce these "indirect expenses" without sacrificing in any way the quality and value of the "Transactions."

Searching still further for a reason for the alleged financial straits of the society, we find a comparison between the average total expenses of the society per member and the average income from dues. It is said:

It appears that for the last 3 years the society has not been able to meet its total expenditure from dues only. It has only kept its head above water by other sources of income, such as sale of its publications to outsiders and by applying a portion of its initiation fees each year to current expenses. It is regarded as an unsound financial policy to spend the initiation fees in this way.

Again, in a later circular, to which we shall refer further on, we are told that "the present returns to the members, in the form of publications and otherwise, cost a sum per annum greater than the aggregate sum received from the members in dues."

Well, suppose it does, is there anything wrong or out of the way in that? What is the money received from initiation fees and from sales of publications to be used for if not for the running expenses of the society? Is there any warrant for treating this part of the society's income as a separate fund? Is not all the money received by the society, from whatever source, to be used alike for the society's benefit? So long as the total income shows a fair sized surplus over the total expenses, why should the members be told that "to maintain the present return at the present rate of dues is to run the society in debt?" A year ago the council's annual financial report showed a surplus income over expenses of about $1,850. The large influx of members during the past 12 months ought to fully offset any reasonable increase that may have been made in the expenses of the society during that time.

Another matter which deserves mention here is the statement which is made in the official circular that the foreign engineering societies have dues larger than those of the American Society of Mechanical Engineers. It is fair to say that that circular was prepared (though not issued) before the publication of *Engineering News* of October 3, in which the dues of a large number of engineering societies, American and foreign, were stated. The actual fact is, as we then showed, that the dues in the American Society are now, and have been for 10 years, higher on the whole than those of any other professional engineering society in the world, except the Institution of Civil Engineers of Great Britain and the American Society of Civil Engineers.

Referring again to the official circular, we find the following:

The dues of the Institution of Civil Engineers of Great Britain, whose position in that country is the closest parallel to that occupied by the American Society of Mechanical Engineers in America, are 4 guineas a year. The council has felt that it is decidedly a better policy to raise the dues to such a point as seemed to be indicated by the experience and wisdom of the English society rather than adopt a policy of "tinkering" with the constitution and rate of dues at frequent intervals. It seems better to raise the dues to the point at which they will be likely to remain.

If this really is what the council felt, one is puzzled to know why they did not propose an increase of the dues to $20 instead of $25, for four guineas amounts in United States money to only $20.50. But the above is a misleading statement of the rate of dues in the English Institution. Here is a direct comparison of the present rates of dues of the two societies, reduced to United States money in both cases:

	Institution of Civil Engineers.	Additional, if Resident in London.	Am. Society of Mechanical Engineers.
Members.....	$15.38	$5.12	$15.00
Associate Mem. or Associate.	12.80	2.56	15.00
"Student" or "Junior,"....	7.68	2.56	10.00

The extra tax on resident members is fully justified in the Institution by the fact that weekly meetings are held at the London headquarters of the Institution for the reading and discussion of professional papers. The American Society, however, holds only one meeting a year in New York; and so far as use of the society house in this city is concerned, we believe, except for a very few local members, the house is more used and more frequented by out of town members, who make it a headquarters while temporarily in the city, than by members residing in New York.

Notwithstanding this, the tax on resident members in the Institution is offset in the American Society by the subscription which resident members are annually called on to make toward expenses in connection with the annual meeting. In proof of this statement, we may quote from the call just issued with reference to the coming meeting:

The experience of late years would indicate that an average of $10 from the contributing members in New York city and surrounding localities would cover the expenses to be incurred.

It will be evident from the above comparison that the dues of the American Society are already quite as heavy as those of the English Institution, and that if the "experience and wisdom" of the Institution are taken as a guide, the dues had better remain at their present figure. There is still one other point in the comparison, however, which deserves notice. In the American Society all grades of membership, except the junior, pay the full rate of dues. In the English Institution full membership is bestowed only on engineers who have "acquired a considerable degree of eminence." Thus the associate members outnumber the members by more than two to one. In fact, of the total membership in the English Institution only two out of seven are full members. In view of this fact and of the comparison in the table above, it must be clear that the expenses attending membership in the American Society actually exceed the expenses connected with the English Institution.

Turning now to the membership list, we find that the proposed increase in dues, supposing that the membership does not fall off, would give the society an increased annual income of about $20,000. It is beyond question that the society is in no financial straits which place it in need of any such large increase in its revenues. Neither has the attempt to justify the increase by a comparison with other societies been successful. The question which the average member is certain to ask (and ask, we fear, in rather strong language) is what is it proposed to do with all this money?

On this important point the members were left pretty much in the dark in the Secretary's circular, dated Sept. 21. It was merely suggested that if the council were in a position to expend larger sums each year the way would be open to "conduct investigations along professional lines by committees of experts." It was also suggested that the society might engage in the preparation and distribution of index material, that more money might be spent on the library, and, finally, that "some provision for more satisfactory housing of the society and its library would have to be considered before long."

It appears from the latest developments that it is the "research" idea that really lies at the bottom of the whole scheme of increasing the society's dues. Under date of Nov. 6, a second circular was issued to the membership, signed by a considerable proportion of the council of the society, in which this is stated in fairly plain terms. We quote as follows:

The council believes the profession of mechanical engineering and the society's own interest and those of its members would be best served by putting the society in such position that it would have money in its treasury for the conduct of research and investigation under committees of competent members, who should furnish the brains and direction for such researches, while paid assistants and the necessary apparatus could be provided from the society's income. The reports of such researches in the Transactions would enhance their value, and the society would take its position as the leading exponent of the highest grade of professional achievement. Will the membership sanction this policy by raising the dues for this object? Does the membership at large agree with the council that this broader policy is the wise and permanent one? The vote is really on this question.

In a further paragraph the council explicitly deny that the increase of dues is propose with reference to changing the society's headquarters or the accommodation of its library. So then we at last have the issue plainly and squarely presented: Will the members of the society vote to raise the dues in order that funds may be provided for the conduct of "research and investigation?"

Now, we have no quarrel at all with the work of "research and investigation." A vast deal of it, good, bad and indifferent—mostly the latter—is being carried on all the time. Agencies and means for its conduct have been supplied with such astonishing liberality during the past two score years that it is not at all infrequently a question of how they may be usefully employed. Stop and think for a moment of the amount of research that is being carried on. There are in the United States alone some fifty to a hundred experimental laboratories in connection with engineering schools. In Europe there are probably as many more. There are besides these the bureaus of investigation in connection with a hundred government departments, as many railway companies, many this number of manufacturing establishments. Think also of the work done in developing and testing new inventions and new enterprises.

Is it not plain enough that the proper function of a great engineering society is not to engage in researches on its own account; but to put on record and make accessible for the general benefit of the profession the important results of researches carried on by the thousand and one different agencies already established?

Of course, there are certain classes of research which fall particularly within the province of an engineering society. The formulation and adoption of standards is one of these. The American Society of Mechanical Engineers has done excellent work in this field in the past, and it can do it in the future, we are fain to believe, without imposing additional burdens upon its membership. The fact is that tests or experiments desired in any work of this sort can almost invariably be secured at some engineering school or manufacturers' laboratory with little or no expense to the society.

It is true, as was stated in the Secretary's circular, that some foreign engineering societies have engaged in research work. In England, the most notable example of this sort is the work done by the Institution of Mechanical Engineers. That society has conducted through committees several elaborate investigations, some of which are still in progress. There came to our desk the other day the results of one of them, in the shape of a bulky pamphlet of 50 pages or more. It was entitled "Second Report to the Gas Engine Research Committee." That looked interesting, and we set to work to find out what practical results had been reached that would be of actual value to a gas engine designer or user. We cannot swear that there was absolutely nothing of value hidden in the mass of mathematics and tables and diagrams, and what not that the pamphlet contained, but long and careful search made it evident that if it was there it was hidden, like Gratiano's "two grains of wheat in two bushels of chaff," so thoroughly that a new research committee was needed to discover it.

We do not believe that the working engineer wants to use or pay for "research" of this brand. The fact is that research carried on for the sake of research is extremely apt to lead nowhere and leave off just where it started. The really valuable researches of the world are not made in such a way. Maunsel White and Fred. W. Taylor set to work to find a special tool steel which would stand a higher speed cut than any steel on the market, and succeeded so well as to start a revolution in machine shop practice. A society might have appointed a dozen committees to make researches on tool steel, but there is little chance that any of them would have achieved any such practical result.

Finally, even if it be thought that the research business is a good one for the society to engage in, there comes the question, ought the society to place further burdens on its membership? This feature is lightly dismissed in the official circular as follows: "It is felt that to practicing engineers of the type represented in the society's membership, this increase is practically nothing so far as its restricting or prohibitory effect is concerned."

But we hear reports on every hand that it does not strike the members at all that way. There are, of course, among the members of the society very many men possessing wealth or in receipt of large incomes. The dues ought not to be gauged by the ability of these men, but by the purses of the working engineers, whose salaries are fixed, it must be remembered, not by the value of their services to humanity at large, but by the inexorable law of supply and demand.

From a pretty intimate acquaintance with engineers of all classes, extending over many years, we can bear testimony to the fact that high professional standing and a large income are by no means always associated. It is suggested in the official circular that the increase of dues might perhaps cause the withdrawal of "those less vitally interested in engineering." The actual fact is that such withdrawals would tend to lower the standard of the society rather than raise it. Engineering is at once a profession and a business. A raise in the dues will make little difference to many engineers engaged in profitable business, while it may make a very important difference to the professional engineer.

A word should be said also as to the increase in the dues of Junior Members. This is a particularly unfortunate feature of the proposed

change, for the Juniors have no vote or voice in the society. They have joined the society on the supposition that they would have to pay only $10 per year, and if they are now forced to pay $15, many of them will have to resign and lose what they have paid in initiation fees.

In the official circular, there is an attempt made to show that the Juniors cost the society more than it receives from them in the way of dues; but the figures given prove nothing. The fact is that all the added expense to the society for an additional Junior or an additional member for that matter, is only the cost of the paper, presswork and binding on his copy of the "Transactions," and other society publications, plus a trifle for express and postage and another trifle for clerical labor in connection with his name. All this will fall very short of $10 per annum. It is not true, therefore, as stated in the circular, that an increase in the proportionate number of Junior Members can cause the society expenses to exceed its income.

The above presents, it seems to us, fairly, and without prejudice, the main arguments against the proposed increase of dues, and it only remains to state how the question is to be decided. When the notice of the proposed increase was given at Milwaukee, and when the Secretary's circular was prepared in September, the idea was that the members present at the December meeting would alone have power to vote on the question. The great bulk of the membership living at a distance from New York were practically disfranchised, for there is no provision for voting by letter ballot on amendments to the "Rules" of this society.

Our contemporary, the *American Machinist*, however, which has been fighting the increase of dues tooth and nail, discovered that under the New York corporation laws, members who could not be present at the meeting could give a proxy to some member who could be present and so record a vote for or against the amendment. That put a very different face on the matter The council of the society held a meeting and decided to send out proxy blanks to the entire voting membership instead of allowing the matter to be settled by vote of the members present only, as originally planned. At the same time a number of New York members who oppose the increase of dues, also arranged to send out requests for proxies to the membership, not knowing that action to this end had already been taken by the council. Thus, every member of the society has now ample opportunity to register his vote, in approval or disapproval, and the result of the ballot, which is to be taken on Wednesday, Dec. 4, will be awaited with interest.

High Power Gas Engines.

In a paper on the topic named in the heading, read by Mr. A. Rollason, of Nottingham, England, at the mid-November meeting of the Glasgow and West of Scotland Technical College Scientific Society, the author commenced his paper by pointing out that the working capabilities of gas engines have considerably increased in recent years, so that motors of more than 100-horse power are now quite common and in daily use, running satisfactorily and comparing favorably in economy with the highest class of steam engines. He went on to say that in this country, the largest engines which have been at work for any length of time indicate about 600-horse power. On the Continent, however, sizes up to 1,200-horse power are at work and giving fairly good results. There are, both in this country and on the Continent, 15 well-known firms making engines of over 250 indicated horse power.

The development of these large powers has not been attained without considerable difficulties having to be overcome; but these having been surmounted, and the conditions understood, there is only the thickness of the cylinder walls, which limits the quantity of heat passing through the metal to the water jacket, to control the size of the cylinder. Multiple cylinders, however, can be used to give any desired power.

All the high power engines, with one exception, work on the "Otto" cycle; and all with two exceptions retain the hot products of the previous explosion which are left in the clearance space or combustion chamber —these products mixing with the new explosive charge taken into the cylinder on the suction stroke. In the exceptions referred to, while the "Otto" cycle has been retained, a pump has been added to positively displace and clear out these products. There are thus two distinct types of engines for comparison—scavenger and non-scavenger.

As early as the year 1860, the late Sir William Siemens described and claimed the process of scavenging by passing a current of air through the working cylinder of a gas engine at the completion of the effective stroke. Since then many inventors have attempted to solve this problem; but it was not until the year 1892, at the Crystal Palace Electrical Exhibition, that an engine with a simple and effective scavenging arrangement was first shown working.

The author expressed the opinion that, from an economical standpoint, all large engines should be constructed to work with fuel gases, as these usually contain from 56 to 70 per cent. of non-combustible matter. He showed the advantages of scavenging out the burnt products by a comparison of the results obtained in engines actuated by the same gas. At the works of Messrs. Brunner, Mond & Co., Limited, Northwich, an engine of each of these two types—scavenger and non-scavenger—of the latest design, by different makers, is in daily use; and careful and reliable tests have been made on them to determine their respective capabilities. Both engines are approximately of the same area in feet per stroke, and also in the proportion of the clearance to the stroke.

An indicator card taken from the non-scavenging engine, working on the fuel gas, showed the clearance volume to be 27.12 per. cent. of the working stroke; while a card taken from the scavenger engine, working on the same gas, showed the clearance volume to be 27 per cent. of the working stroke. This positive scavenging action clears out the burnt products, and the volume of air which is swept through the cylinder lowers the temperature of the walls, piston and valves, and prepares them to receive the incoming charge. As there is left in the clearance space a volume of air at a lower temperature, a greater quantity of gas can be taken into the cylinder on the suction stroke, and without increasing the loss to the water jacket.

The non-scavenging engine may be taken to be the latest and best of its type. With an increase in the ratio of gas to air, the power developed, with 74.25 explosions per minute, was 116.45 indicated horse power; but the gas consumed was 62.74 cubic feet, and the thermal efficiency fell to 28.61 per cent. In a non-scavenging engine we can reduce the clearance with a corresponding amount of residue; but in doing this we increase the compression. For many reasons, in large engines of this type, high compressions are not desirable.

Mr. Rollason gave two tables from the report of the Gas Engine Research Committee of the Institution of Mechanical Engineers, with indicator diagrams, to show the effect of increasing the compression by reducing the clearance, and of varying the quantity of gas admitted without changing the compression. He then went on to say that all gas engines run at fixed speeds. Consequently, if the combustible charge admitted to the cylinder when using fuel gas is not of fairly constant composition, the ignition of the charge may be delayed, or it may fail to ignite. When a hot tube is used for the ignition, trouble frequently arises as the composition of the charge varies. The igniting point being a fixed one, any variation in the heat value will alter the rate of propagation of the flame and the pressures developed in the cylinder. The correct timing of the point of ignition is of great importance in large engines. All carbon gases are slow to ignite, and as in some cases their composition constantly varies—some as much as from 33 to 40 per cent. in heat value—the rate of propagation of the flame in the mass is not constant. The gases used should be clean and free from dust or tarry matters, and of constant composition. Gases containing hydrogen, owing to its greater affinity for the oxygen contained in the charge, are superior for engine use than those where the chief combustible is carbonic oxide, though the heat value of each is practically the same. All large engines using fuel gas should have electric ignition.

Referring to the common practice of comparing gas engines with those working by steam, Mr. Rollason pointed out that a different set of conditions exists. He explained that a gas engine is a machine which has to automatically control the amount of combustible matter required to be admitted to its cylinder in proportion to the work given out by its crank shaft, however variable that work may be, in order to keep the speed constant. Excepting the flywheel, there is no reserve of power behind the piston as in the steam engine; consequently, unless all parts work in unison, the machine fails to act. In running, if the weight of the charge taken into the cylinder before compression is reduced by heating, and the composition of the gases in the charge varies, the power given off will be greatly lowered, and the engine will work unsatisfactorily, owing to the difficulty in igniting the charge at the correct moment to suit the composition taken in. But if a practically constant gas is used, however low its calorific power may be, the engine can be so adjusted as to give the best results. This was shown by another table and diagrams from the report of the Gas Engine Research Committee.

In bringing his paper to a close, the author emphasized the fact that, in working large engines, the best all-round results are to be obtained by scavenging out the hot products, combined with the water jacketing of the piston and exhaust valve. He pointed out that in the construction of these engines, the best quality of materials should be used, with

a liberal allowance in the weight and size of the parts in excess of the calculated strength. The bearings and moving parts should have large surfaces, and the workmanship be of the highest class. In daily operation, care should be taken that a constant supply of cold water, either from a tank or other source, is provided; also that the cylinder jacket does not get overheated, as large engines are liable to be strained by the expansion of the metal should this occur. A small and regular supply of oil is required to be fed to all the moving parts, but only sufficient for lubricating purposes. If too much is fed to the cylinder in non-scavenging engines, the surplus generally carbonizes and adheres to the back of the piston and exhaust valve seat, causing loss of power through leakage and frequent premature ignitions. The arrangement for silencing the exhaust should be of ample capacity to prevent any back pressure on the engine. If the exhaust is throttled in non-scavenger engines, a greater volume of hot products is left in the clearance space; and there is also a further liability of a portion already expelled being again drawn into the cylinder during the suction stroke. If these conditions are observed, the gas engine will be found to be as reliable a motor as the steam engine, it will require no more attention, and it will amply repay the user in fuel economy.

Regarding the Use of Portland Cement.

Mr. H. H. Humphreys, in a lengthy article in the London *Builder*, goes over the subject of the causes of expansion and contraction of Portland cement concretes and mortars, which are so troublesome and disappointing when they occur in engineering structures. It is admitted that alterations of volume of concrete or mortar after setting sometimes occur apparently capriciously; but the causes of the mischief may be classified under the two heads of: (1) Disruptive stresses due to internal movement in the cement; and (2) disintegrating atmospheric conditions. Heading No. 1 can be split up, and the responsibility for the trouble can be divided between the manufacturer and user thus: Causes of movement within the control of the manufacturer, improper proportioning of the raw materials, insufficient burning, excessive chemical impurity, presence of artificial adulterants, and bad milling. The user is responsible for employing new and unaërated cement, or too rich mixtures, more especially for rendering. With regard to the former class of defects, it is explained that manufacturers are exposed to the temptation to raise the tensile requirements for the week's test. This leads to over liming, when the 28 days' test may show 30 per cent. less strength than the week's test. Insufficient burning is due to the temptation to economize overmuch in coke. It is easy to detect, by the low specific gravity and brownish color of the fresh cement. Excess of magnesia is dangerous, but does not occur in the cements made on the Thames and Medway. Sulphate of lime is a dangerous impurity. Bad milling is a mischievous fault. The old specification of 10 per cent. residue on a 2,500 mesh is obsolete. No standard degree of fineness seems to be accepted; but it is stated that a sample recently tested by the author's firm showed a residue of only 3.2 per cent. on the 14,400 sieve. At least one large cement works in this country has under consideration the expediency of separating the coarser from the finer grain of cement, and regrinding the former. The user is counselled on no account to neglect the emptying out and careful turning of his cement purchases before using.

Cement used for rendering, with the object of making brickwork water tight, should always be mixed with an equal part of absolutely clean, sharp sand. Neat cement always cracks; and a further cause of dissatisfaction with its use is the inability of workmen to spread it fast enough, which constantly tempts the men to "knock it up." All cement work should be covered up in frosty weather, and kept damp in summer and carefully screened from sunshine. The latter is most important.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

"M," WRITING to the JOURNAL under date of the 3d inst., says: "An odd sight, that might have been looked over with wonder, could have been seen a few weeks ago, in Station B, of the works of the Detroit City (Mich.) Gas Company. The manufacturing output of the Company, of course, was greatly increased when the importation of natural gas from Canada was stopped; to say nothing about the successful summer's work of Manager Paul Doty in causing an increase in the natural way in the output. The Detroit Company had had ample warning of the proposed shutting down of the supply of natural gas from the Canadian wells, and had prepared for the changing conditions by ordering sufficient plant to make up the deficiency on its own manufacturing account. The contractors were unable to deliver certain boilers that were to be operated in connection with the additional water gas sets. The demands for gas, however, were such that they could not be ignored; wherefore, Manager Doty—the generator sets having been erected in good order—induced the Railroad Company to run a locomotive on the works' siding, and from the locomotive he secured a sufficient supply of steam to keep the sets going until the ordinary or usual boilers were placed."

THE successor to the Port Huron (Mich.) Excelsior Electric Company is the Port Huron Light and Power Company. Its officers are: President, H. McMorran; Vice-President, C. F. Harrington; Secretary and Treasurer, W. F. Davidson.

MESSRS. ADAM WEBER SONS, of this city, desire to state that Mr. E. S. Capron, President of the Attleboro (Mass.) Gas Light Company, is ready to vouch for the fact that the Weber construction recently done on that plant is in every sense satisfactory. In the copy of Mr. Capron's letter respecting his opinion of the Weber work this paragraph appears: "The four circular chimneys, made with your radial brick, are a very great improvement over any method of construction by means of ordinary rectangular brick, and show a neat and substantial appearance."

THE new holder for the North Adams (Mass.) Gas Light Company, the capacity of which is rated at 325,000 cubic feet, and which is being constructed by the Davis & Farnum Manufacturing Company, of Waltham, Mass., will be completed by January 1st.

MR. C. F. CATTELL, Superintendent of the Gas Company of West Chester, Pa., has good reason to congratulate himself over the results that are attending his persistent work of last spring and summer. A friend of his informs us that the gain in output there for the past quarter, on a percentage basis, was not less than 20.6.

THERE was an acetylene gas plant in Bradford, Ont., the morning of November 28th. An explosion in the generating apparatus put the plant out of commission the afternoon of like date.

THE gas and electric lighting properties of Wilmington, Del., have been consolidated under the title of the Wilmington Gas and Electric Company.

MR. P. ANDERSON, Manager of the Solano (Cal.) Electric Light and Gas Company, reports that the business of the Company is increasing in a satisfactory way. He avers, however, that the proprietors will not pay due heed to the profit that might be derived from an accurate working of the gas division of their enterprise.

THE people of Lead, South Dakota, are clamoring for a gas supply, because the rates charged there for electric lighting are excessive.

MR. S. S. RUBIRA, President of the Mobile (Ala.) Gas Light and Coke Company, and Vice-President of the Electric Lighting Company, of Mobile, as well, writing to us under date of November 26th, says:

To the Editors AMERICAN GAS LIGHT JOURNAL: In your issue of November 25th, you give the following information: "The Consolidated Street Railway Company, of Mobile, Ala., has applied for the right to construct and operate a gas works there. This concern owns all the lighting and traction systems of Mobile, save the Mobile Gas Light Company, and it could secure the latter's property, if it would pay a fair price for it." As Vice-President of the Electric Lighting Company, of Mobile, which Company supplies the major part of the commercial electric service of this city, as well as all of the street lighting, I have to state that it does not form part of, nor is it owned by the so-called Consolidated Street Railway Company. As President of the Mobile Gas Light and Coke Company, I have to add that the statement made in regard thereto is merely an assumption on the part of your informant, as we have furnished no grounds therefor. Regarding the gas franchise applied for, the inclosed report of the meeting of our city Council shows it was virtually refused, and, from what appears in the report, the probability of its being granted seems very slim. Our people have learned that competition in gas is delusive and works injuriously to the city. It may be of further interest to your readers to know that a franchise (notice whereof is also inclosed) has been applied for by Mr. G. S. Leatherbury, Jr., a local capitalist, to build electric roads which will cover a good part of the city."

In the merging of the interests of the Wilmington (Del.) Coal Gas Light Company with those of the Universal Conduit, Heat, Light and Power Company, which was effected under the title of the Wilmington Gas and Electric Company, the officers named to direct the affairs of the succeeding corporation were the following: Directors, James Dobson, George S. Capelle, John Dobson, Samuel Bancroft, Jr., Thomas F. Barry, William W. Lobdell, William S. Hilles and Edmund Mitchell, Jr.; President, James Dobson; Vice-President, Ed. Mitchell, Jr.; Secretary and Treasurer, William P. Taylor.

In connection with the above mention the following history connected with the Wilmington Coal Gas Company will be of interest:

"The Wilmington Coal Gas Company was chartered by Act of Legislature, March 4, 1851, and began to supply gas to customers that year, having a successful career of fully 50 years. It bought out the Wilmington Gas Company September 26, 1856, for $6,800. This latter Company was chartered February 2, 1835, and furnished a part of the southern section of the city with gas made from rosin, at $7 per 1,000 cubic feet. The leading men in these old Companies represented prominent families here, and have mostly passed away, but it may interest some of our people who are fond of the traditions of the city to have their memories recalled and preserved for reference. The Directors of the Wilmington Gas Company were: Charles Bush, Nelson Cleland, John Wales, Samuel McClary, William Chandler, Thomas Garrett and William H. Naff. The President was Nelson Cleland; Superintendent, Samuel McClary; Secretary and Treasurer, William H. Naff. The gas works and holder were situated on ground now owned and occupied by the J. Morton Poole Company, near the corner of Water and Orange streets. The incorporators of the Wilmington Coal Gas Company, who were also the first Directors, were: Jesse Sharpe, Joshua T. Seal, Joseph Seal, John A. Duncan, Stephen Bonsall, Samuel McCaulley, William Chandler, Washington Jones and Jacob Rice. The following were the later Directors in the order of their election: William Bucknell, Jr., R. R. Porter, M.D., George Richardson, Thos. B. Rice, Benjamin S. Clark, John Richardson, Joseph T. Warner, John Rice, Thomas C. Alrich, Stephen S. Southard, Edward Betts, Edward T. Bellah, Joseph Bringhurst, Jacob Derickson, M.D., Thomas J. Lawson, Samuel Floyd, Edward Bringhurst, Joseph Richardson, William P. Taylor, George S. Capelle, John H. Adams, John Jones, Thomas Jackson, Edward Bringhurst, Jr., Samuel Bancroft, Jr., Alfred D. Poole, Henry C. Jones, John Dobson, James Dobson, William S. Hilles, Thomas F. Barry, William W. Lobdell, Edward Mitchell. The first President of the Company was Mr. Stephen Bonsall, who served from March 11, 1851, to September 9, 1864, when he resigned. He was followed by Mr. George Richardson, who served from September 9, 1864, until he died, June 23, 1888. His term was followed by that of Mr. Edward Betts, who served from July 3, 1888, to the termination of the Company's existence. The Company had no Vice-President until July 3, 1888, when George S. Capelle was chosen and served until the merger. The first Treasurer was Washington Jones, who was elected March 13, 1851, and served until September 11, 1855; he was succeeded by Mr. John A. Duncan as Secretary and Treasurer on that date, who served until his death, on August 5, 1868. Mr. Thomas J. Lawson was elected in his place, August 22, 1868, and resigned January 2, 1877. Mr. Wm. P. Taylor was then elected and continued until the end. The first Superintendent was Mr. Thomas J. Mahaffy, who was chosen Nov. 21, 1851, and resigned March 19, 1867. Mr. Thomas Curley was then chosen, and has served continuously since as Superintendent, having been, however, with the Company during the erection of the works and ever since."

The authorities of Rochester, N. Y., have so far failed to agree with the Rochester Gas and Electric Company as to the price at which the former may take over the electric conduit system constructed by the Company.

Following our notice that Mr. John C. Schmidt, of York, Pa., had secured a controlling interest in the properties of the Gettysburg (Pa.) Gas Company, it is said that the following reorganization of its executive management was perfected: Directors, John C. Schmidt, C. C. Frick, P. M. Bikle, J. W. Diehl, John B. McPherson and Chas. S. Duncan; President, J. W. Diehl; Secretary and Treasurer, Chas. E. Stahle. The new owners propose to virtually rebuild the plant and to make concessions as to the service in general, in respect of price, piping, etc.

Mr. Benjamin J. MacDonald, who will be pleasantly remembered by the fraternity as the clever Manager for many years of the gas supply of Newburgh, N. Y., is to be congratulated on the success which is attending his last venture in the lighting field. With his associates he some months ago secured control of the gas and electric lighting supply of Bristol, Tenn., and the gratifying result is that the business of the concern has been increased quite over 50 per cent. from the time they assumed ownership. The betterment work now in hand includes an extension of the Company's mains to districts of the city that had been woefully neglected by its former proprietors.

The Railroad Gas Lighting Company, of Chicago, has been incorporated by Messrs. William S. Freeman, H. W. Wolfeley and B. B. Baker. It is capitalized in the sum of $100,000.

Mr. William P. Fardy, Superintendent of the gas works of the Hudson (N. Y.) Light and Power Company, is well satisfied with the progress that is being made on account of plant betterment, but is sorry that the owners did not place their contracts for such betterment a trifle earlier in the season. All of which is meant to imply that it is now up to Mr. Fardy to make excuses to the gas consumers, whose demands for light are far in excess of the present capacity of the works.

As an instance of the growth of the business of a gas company, between the times of old and new management, the case of the Philadelphia Suburban Gas Company may be fairly cited. In 1890, the Darby Gas Company, of Darby, Pa., was struggling along in very modest fashion, with not over 100 3-light meters in use, and the average selling rate was *not* in excess of $2 per 1,000 cubic feet—quite a stretch of territory from Darby to Eddystone was not then piped. About two years ago Mr. F. H. Shelton and his associates secured control of the Darby Company, rechristened it the Philadelphia Suburban Gas Company, extended the mains from Darby to Eddystone in sensible way and put the selling price at a fair figure with this result: Over 2,400 meters are in use, the output is at least 600 per cent. greater than it was in 1895, and the close outlook is that even larger returns are at hand. Certainly the increasing number of residents in the territory named has had much to do with the Company's prosperity, but the management of the concern evidently should assume the larger share of the glory, for in the last two years the percentage gain in population between Darby and Eddystone certainly did not exceed 10.

H. S. Pettigrew, Frank Kramer and F. N. Pettigrew have incorporated the Geneseo (Ills.) Gas Company. It is not thought that a works will speedily follow the filing of the papers, for our informant adds, "The incorporation is in the nature of a precautionary measure."

The *Gas World* (London) says that, according to a copy of the Auckland (New Zealand) *Star*, the formal "opening" of the Auckland Gas Company's new gasholder was witnessed the 16th of October last—the holder was "made in America." The company present were addressed by Mr. T. Peacock, the chairman of directors. He said the holder was by far the largest in the Colony, having a capacity of 1,100,000 cubic feet, with provision for the addition of another lift when necessary. The work had cost £23,000. The whole work on the tank had been carried out by the Company's men, under the superintendence of the engineer, Mr. Chenery Suggate. The holder itself was supplied by Messrs. R. D. Wood & Co., of Philadelphia, to the designs of Mr. Suggate. At the conclusion of the chairman's address Mr. Suggate gave details of the work, which was started in December, 1899, when operations on the tank were begun. He said he would have preferred a holder made in England, but it was not a matter of sentiment but of £ s. d. About 35,000 tons of material were excavated, and they put in 5,800 tons of concrete. There were about 500 tons of steel in the holder, and they had put in 400,000 rivets. All the work, with the exception of the fitting together of the holder temporarily, had been carried out by local labor, and the holder had cost less than the average cost of like sized ones at home. Mr. Suggate then handed to Mrs. Peacock a silver valve handle with which she turned on the gas to the holder, and after the representative of the contractors for the holder had been presented by the Chairman with a piece of silver plate, as a souvenir of his visit, the guests were entertained to light refreshments.

The Standard Light Company, of Wilmington, Del., has been incorporated, to manufacture and deal in incandescent lights and electrical fittings. It is capitalized in $500,000.

The authorities of Buckville, Ont., propose to expend $50,000 next season on improving the municipal gas and electric light plants.

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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MONDAY, DECEMBER 9, 1901.

The Market for Gas Securities.

Dullness and strength were the latest marks made in the market for city gas shares. There was some trading in Consolidated gas, the commencement of the dealings having been made at average prices lower than those of a week ago. Later on a better market developed, with the result that at the close to-day (Friday) the quotations were 217 to 218¼, ex dividend of 2 per cent. A fair inquiry for local gas bonds is reported.

Brooklyn Union is featureless, the quotations therefor being strictly nominal. Peoples, of Chicago, is unchanged. In fact, dullness is the ruling factor; but it does not seem to be the dullness that precedes a marked decline.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 9.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	217	218½
Central Union, Bonds, 5's.	3,000,000	1,000	109	110
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	295	305
" Bonds	1,500,000	1,000	00	102
Municipal Bonds	750,000	..	..	.
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	107	107½
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River.. Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000	..	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	135
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,650	500	120	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	210	214
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅞	1
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works..	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	95	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	11¼	11½
" " Bonds, 5's	5,250,000	1,000	80¾	81¾
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650.000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	102	102½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	380,000	1,000	79	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50		89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	53	55
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	66
" Bonds, 6's	2 650,000	..	99½	101½
Jackson Gas Co.	250,000	50	67	70
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	91	94
Preferred	2,500,000	100	103	.
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	99¼	99½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d " "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	46	46¼
St. Paul Gas Light Co.	1,500,000	100	60	63
1st Mortgage 6's.	650,000	1,000	112½	115
Extension, 6's.	600,000	1,000	112½	115
General Mortgage, 5's.	2,465,000	1,000	84	86
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	93	96
Syracuse, N. Y.	1,750,000	100	17	19
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	32⅞	32¾
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	107	108½
Wilmington, Del.	600,000	50	232	..

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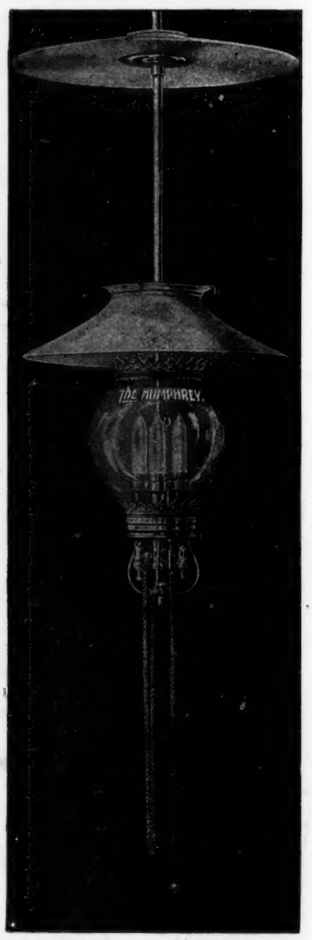

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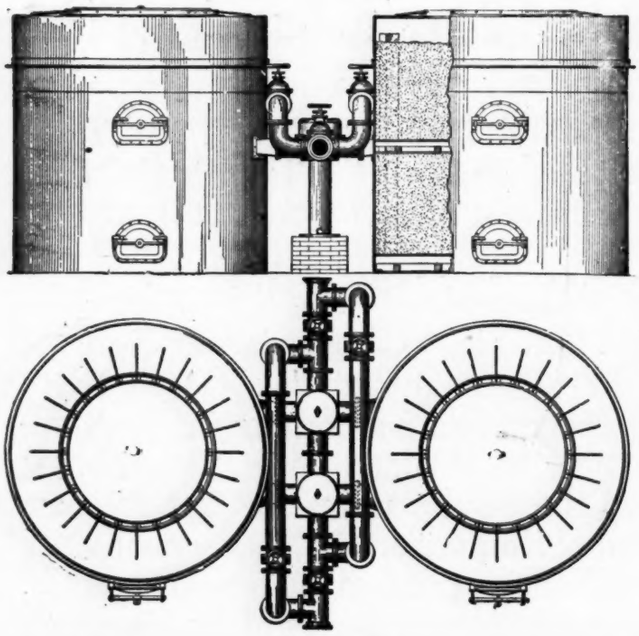

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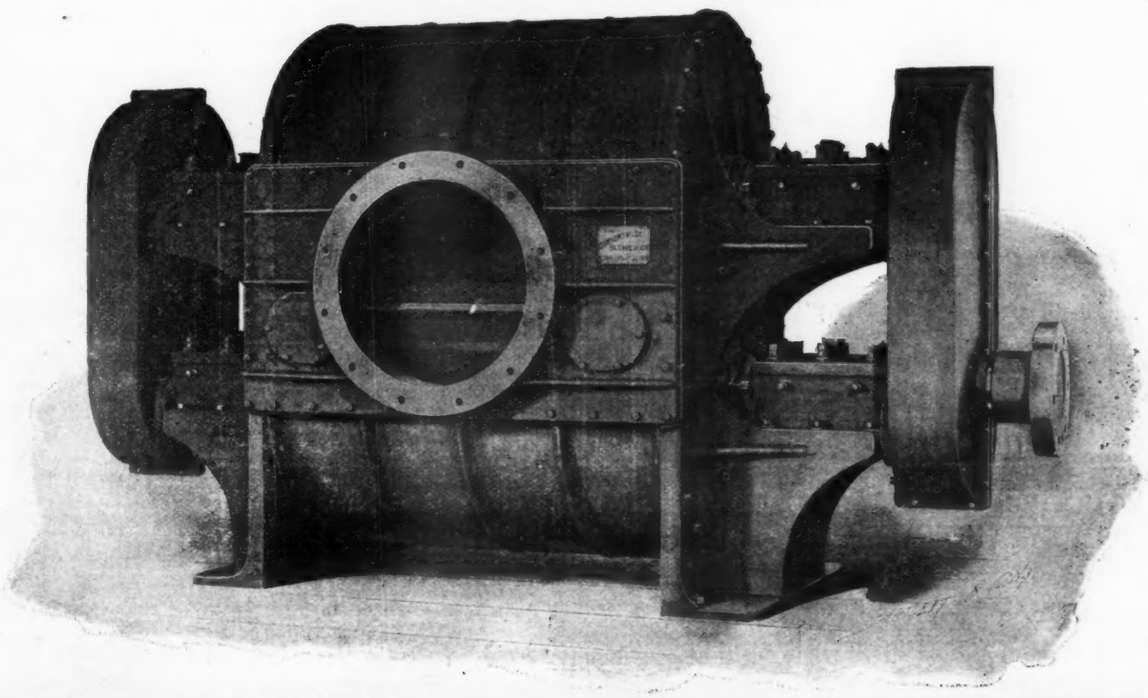

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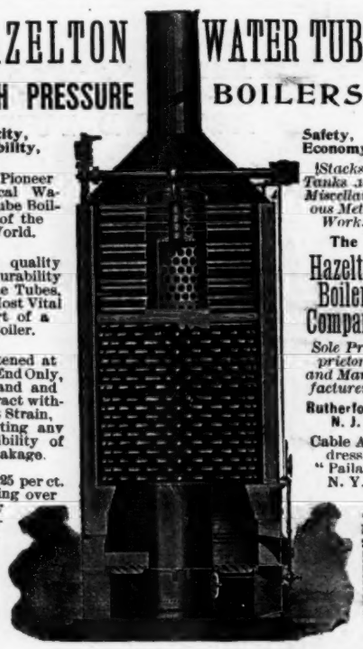

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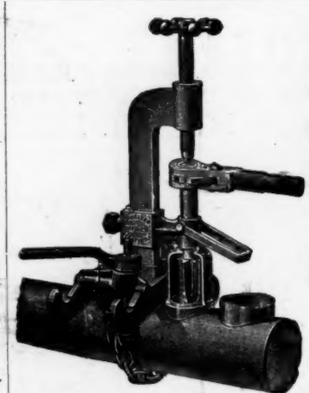

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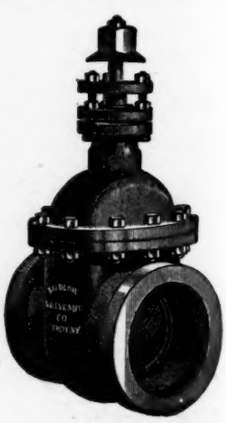

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GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

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Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa.

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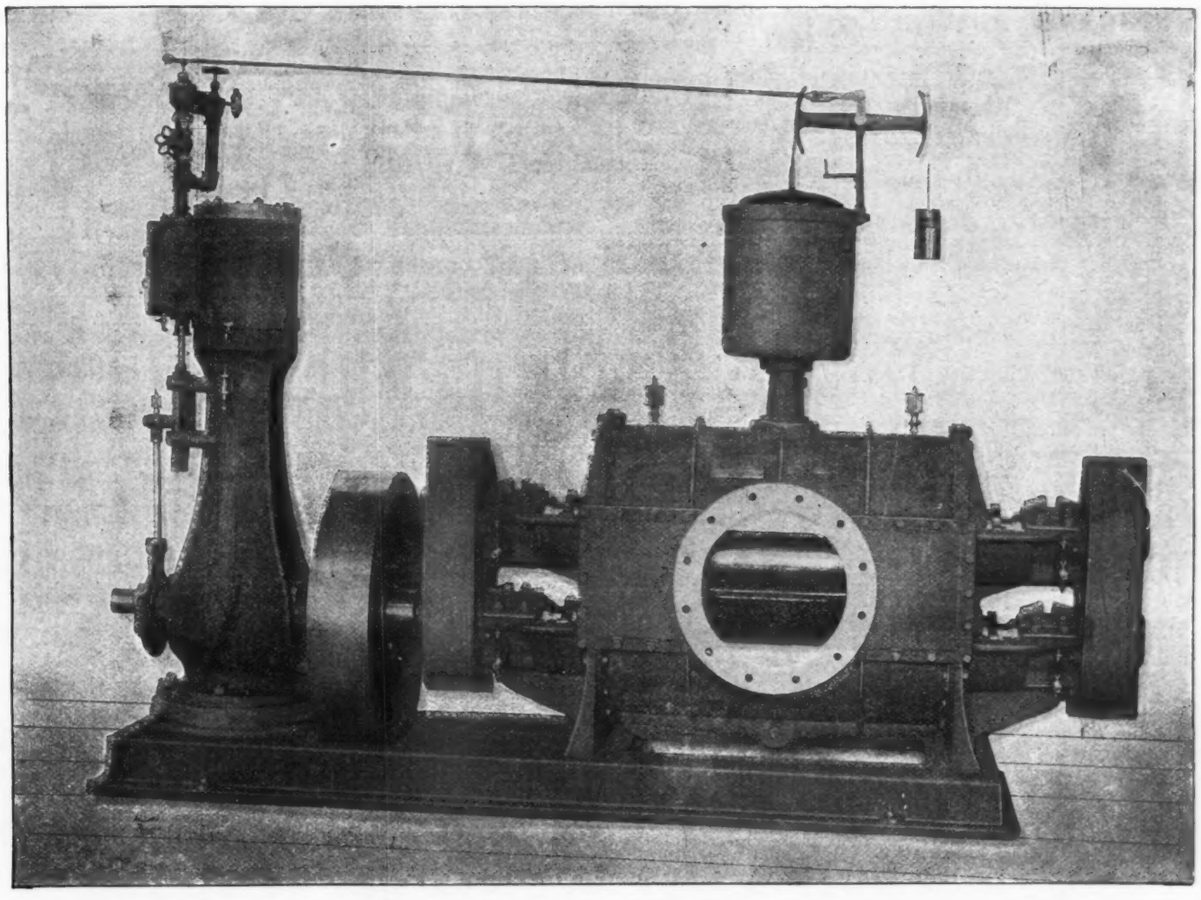
NEW GAS EXHAUSTER.

Always in the lead. Always anticipating the requirements of the trade. Our new Exhauster meets all demands of modern gas making and overcomes all difficulties heretofore experienced.

OUR GAS GOVERNOR IS MAKING FRIENDS EVERY DAY.



P. H. & F. M. ROOTS CO.,

Connersville, Ind. **109 Liberty St., New York.**

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

"GLOBE" SPECIALS, VALVES, ETC. "GLAMORGAN" PIPE FITTINGS

M. J. DRUMMOND & CO.

MANUFACTURERS OF

CAST IRON FLANGE GAS AND WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
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DONALDSON IRON COMPANY. EMAUS, PA.

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MANUFACTURERS OF

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FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

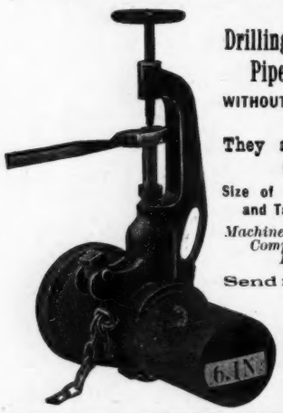
WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.



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SAFETY GAS MAIN STOPPER Co.

108 EAST 117TH ST., N. Y.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

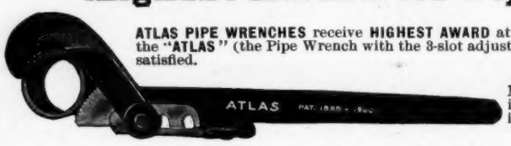
New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

Highest Award for Pipe Wrenches.



ATLAS PIPE WRENCHES receive HIGHEST AWARD at Pan-American Exposition. If you are not using the "ATLAS" (the Pipe Wrench with the 3-slot adjustment) give it a trial, and we believe you will be satisfied.

Made in four sizes: 10-inch, 18-inch, 24-inch and 36-inch, handling everything from ⅛-inch wire to 4½-inch pipe. Ask your Supply man for the "ATLAS."

—Manufactured by—

ATLAS PIPE WRENCH CO., 121 Liberty St., New York. 51 Flood Building, San Francisco, Cal.

Parson's Steam Blower

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial.* No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., 457 Putnam Ave., Brooklyn, N. Y.

Hughes' "GAS WORKS,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.
Rewritten and Much Enlarged by
WM. RICHARDS, C.E.

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

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Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

SECOND EDITION.

THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

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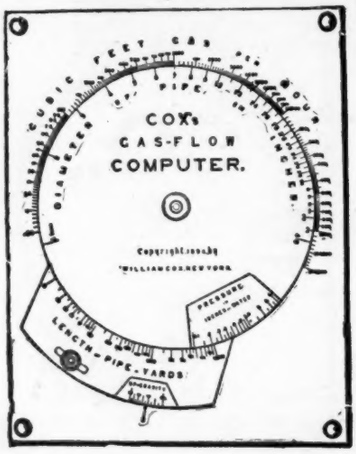

Do you wish to Know

what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

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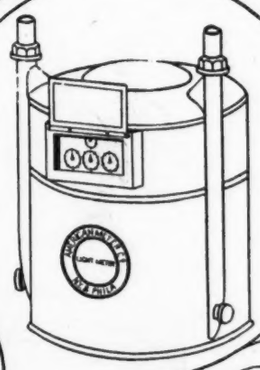

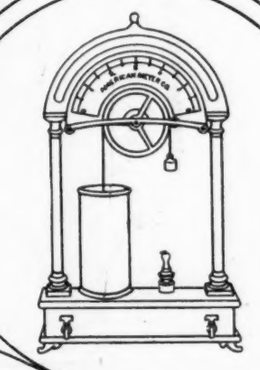

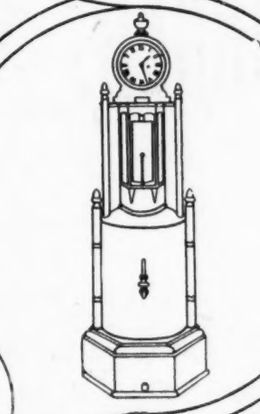

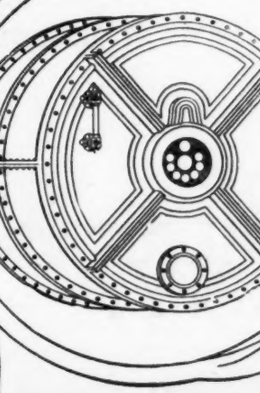

AMERICAN METER CO.

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NEW YORK AND PHILADELPHIA,

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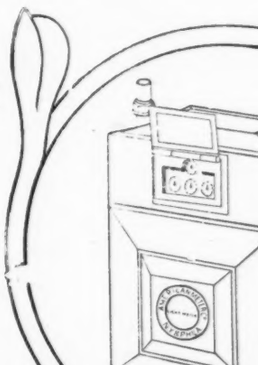
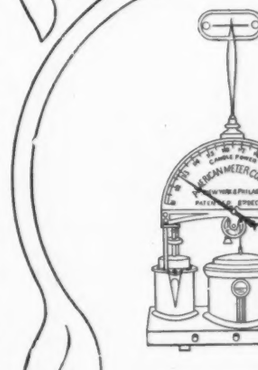
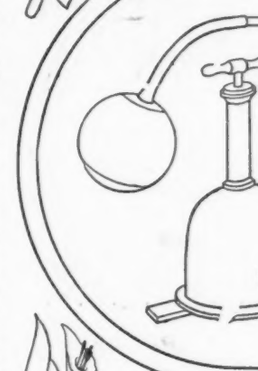
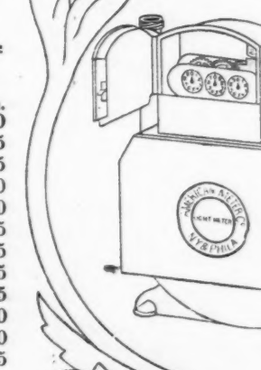








PUBLIC LIGHTING TABLE.

DECEMBER, 1901.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	5.00 PM	12.00 PM	4.20	6.10
Mon.	2	5.00 LQ	1.00 AM	4.20	6.10
Tue.	3	5.00	2.00	4.20	6.15
Wed.	4	5.00	3.00	4.20	6.15
Thu.	5	5.00	3.50	4.20	6.15
Fri.	6	5.00	4.50	4.20	6.15
Sat.	7	5.00	6.10	4.20	6.15
Sun.	8	5 00	6.10	4.20	6.15
Mon.	9	5 00	6.10	4.20	6.15
Tue.	10	5.00 NM	6.10	4.20	6.20
Wed.	11	5.00	6.10	4.20	6.20
Thu.	12	5.00	6.10	4.20	6.20
Fri.	13	5.00	6.10	4.20	6.20
Sat.	14	5.00	6.10	4.20	6.20
Sun.	15	8.10	6.20	4.20	6.20
Mon.	16	9.10	6.20	4.20	6.20
Tue.	17	10.20	6.20	4.20	6.20
Wed.	18	11.20 FQ	6.20	4.20	6 20
Thu.	19	12.30 AM	6.20	4.20	6.20
Fri.	20	1.40	6.20	4.20	6.20
Sat.	21	2.50	6.20	4.20	6.20
Sun.	22	4.00	6.20	4.20	6.20
Mon.	23	5.10	6.20	4.20	6.20
Tue.	24	No L.	No L.	4.20	6.25
Wed.	25	No L. FM	No L.	4.20	6.25
Thu.	26	No L.	No L.	4 20	6.25
Fri.	27	5.10 PM	8.30 PM	4.20	6.25
Sat.	28	5.10	9.40	4.20	6.25
Sun.	29	5.10	10.40	4.20	6.25
Mon.	30	5.10	11.50	4.20	6.25
Tue.	31	5.10	12.50 AM	4 20	6.25

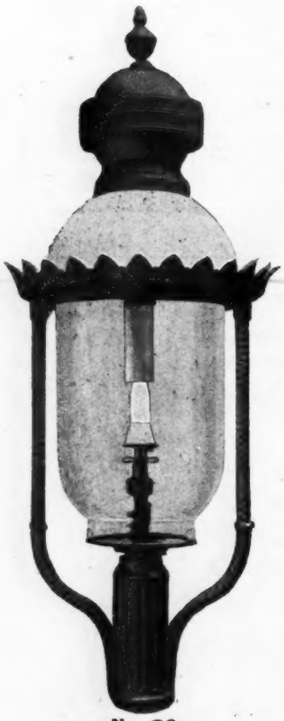
TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

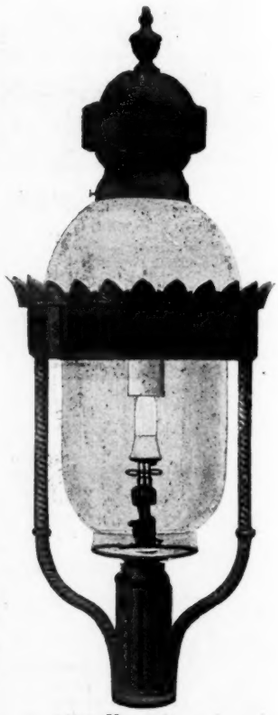
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.

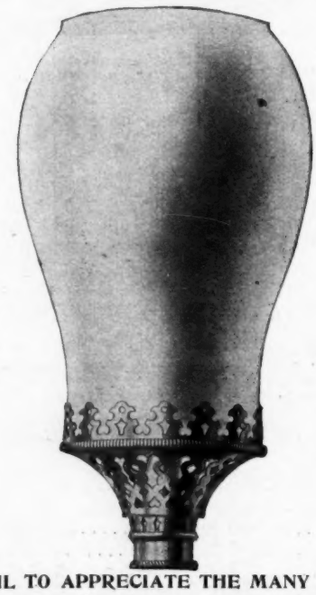


No. 38.

UNIVERSAL WELSBACH BURNER.

The most practical, efficient and artistic burner yet produced. . . . . .

It contains an improved adjustable Bunsen so constructed as to permit of a wide range of variations in gas pressure without blackening the mantles and without an adjustable air shutter. . .



It can be used with all styles and sizes of glassware, either shades or globes. No further necessity to carry a stock of different burners for the many sizes and shapes of glassware.

GAS COMPANIES AND DEALERS CANNOT FAIL TO APPRECIATE THE MANY SALABLE FEATURES OF THIS NEW BURNER.

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Salesrooms in all the Leading Cities of the United States.

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

The capacity of apparatus installed, if operated continuously, is sufficient to make more than the entire amount of artificial gas annually sold in the United States.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
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H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

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Fire Brick Manufg. Co.,

Manufacturers of { CAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

Office:
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S. D. MERTON. F. R. SELLMAN.

S. D. MERTON & CO.,
CONTRACTORS AND FURNACE BUILDERS,
ST. LOUIS.

WE DESIGN AND BUILD
HIGH GRADE BENCHES.

Adam Weber Sons,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces.

Standard Fire Brick and Gas Retorts.

ISAAC C. BAXTER, President.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR., CO.,

Successor to WILLIAM GARDNER & SON,

PETER YOUNG, Sec'y and Treas.

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Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,
BENCH SETTINGS,
Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg, Ills., or Buffalo, N. Y.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec.
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT
LOCUST POINT, BALTIMORE, MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Our Improved Half and Full Depth Benches have been Adopted by Many Gas Companies.

VALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

JOHN DELL,
General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED
1882.

— MANUFACTURERS OF —

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are prepared to furnish and erect COMPLETE, Half and Full Depth Benches of 6's, 8's, 9's, with Regenerative Furnaces, Constructed to Burn either Coal or Coke. Also Plain Benches.

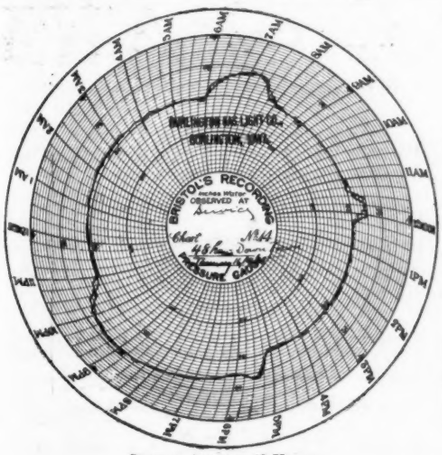
CORRESPONDENCE IS RESPECTFULLY SOLICITED.

{ CITY OFFICE:
411 Olive St., Continental Bank. } ST. LOUIS, MO.

A GAS GOVERNOR,

Particularly a CONNELLY Gas Governor,

Is as essential to the operation of a gas works as the Governor of any of our great States is necessary to the successful working of one of these political bodies.



DOUBLE RECORD 48 HOURS.

BURLINGTON GAS LIGHT CO., 215 Jefferson Street, Burlington, Iowa, April 8, 1901.

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Dear Sir: You are at liberty to keep the pressure sheets sent you recently. If my testimony would have any weight with your prospective customer, you might tell him that all that is necessary to make a CONNELLY Governor just as automatic as the charts we send you indicate, 24 hours in the day and 365 days in the year, is to spend about a half hour's time each YEAR cleaning it. Yours truly, E. D. CLARY, Supt.

Mr. Clary is only one of scores of gas managers who find Connelly Governors absolutely indispensable. We are in business to give you all the information you can wish about Governors.

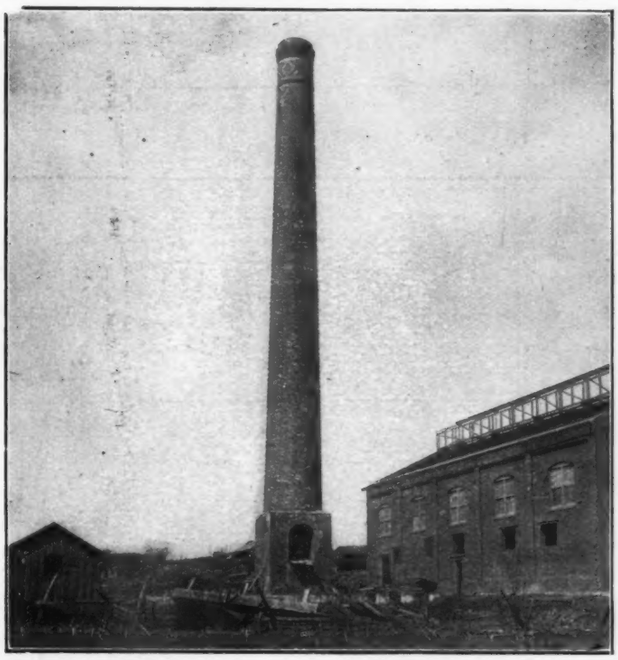
Connelly Iron Sponge and Governor Co.,

395 BROADWAY, NEW YORK.

ADAM WEBER SONS,

Manhattan Fire Brick & Enameled Clay Retort Works,

Designers and Builders of Chimneys of Perforated Radial Bricks.



A. M. Young, President, New England Engineering Co., New York, March 30th, 1901.

Adam Weber Sons, 633 E. 15th St., N. Y. City—Gentlemen: It is a pleasure for us to state that the chimney built for us by you, at the works of the Nazareth Cement Co., at Nazareth, Pa., is an exceptionally fine one. We are certainly pleased with the workmanship on the same, and feel that there is no finer chimney anywhere if construction is considered. Yours very truly,

H. P. HAMPSON,
General Manager New England Engineering Company, at Nazareth, Pa.

Chimney of perforated radial bricks, designed and built by ADAM WEBER SONS for the Nazareth Cement Company, at Nazareth, Pa.

Main Office and Depot, No. 633 East 15th St., New York City. Works at WEBER, on Raritan River, Middlesex County, N. J.

The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.

Practical Hints on the Construction and Working of Regenerator Furnaces,

By MAURICE GRAHAM, Assoc M.Inst.C.E.

Price, $1.25. For Sale by

A. M. CALLENDER & CO., No. 32 Pine Street, New York City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

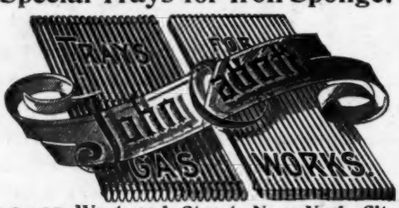
BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

Church's Patent Trays.
Reversible; Strongest; Most Easily Repaired.
Special Trays for Iron Sponge.



553-557 West 33d Street, New York City.
We also Supply the Cheapest and Strongest
•Reversible Bolted Trays•
IN THE MARKET.
SEND FOR CIRCULARS.

Elevators for Everything.

JEFFREY
ELEVATING MACHINERY
FOR HANDLING
COAL, COKE, ETC.

COKE CRUSHERS.
SHAKING SCREENS.
POWER TRANSMISSION MACHINERY.

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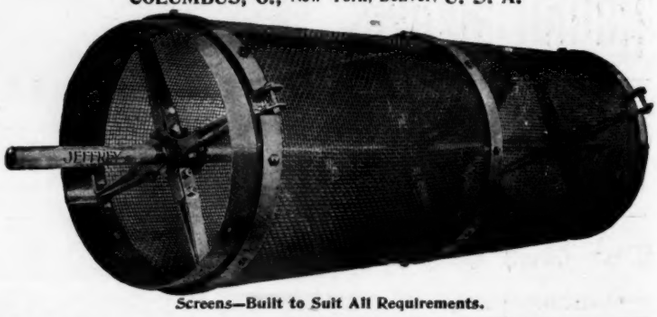

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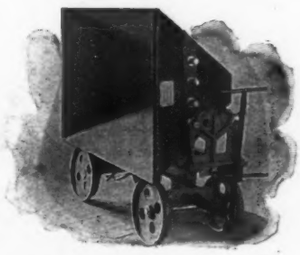

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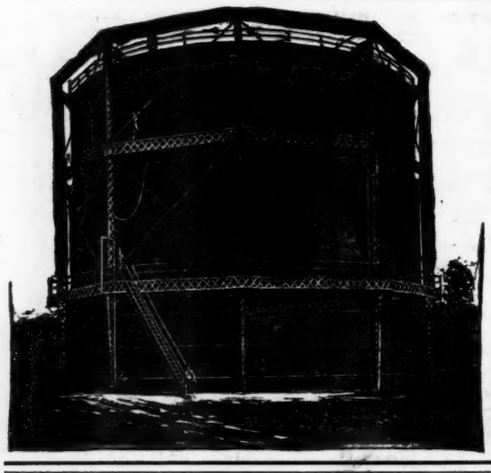

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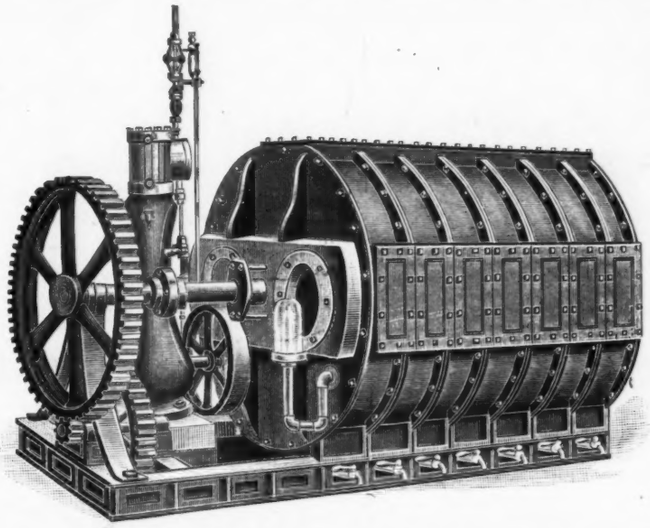

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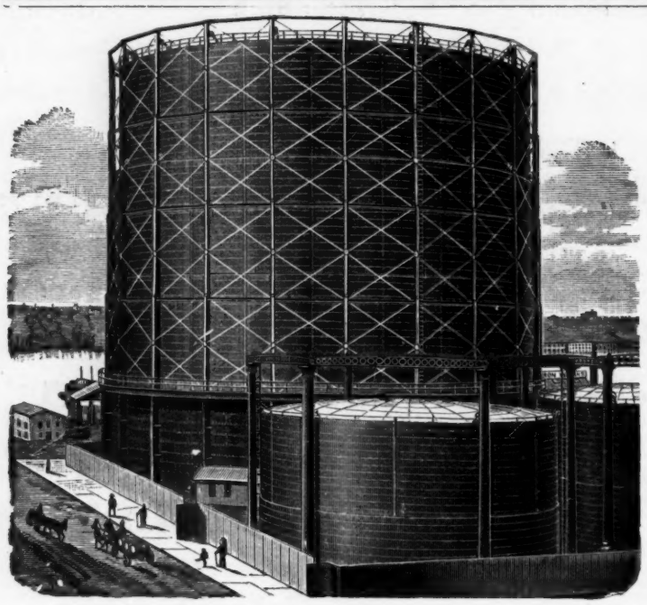

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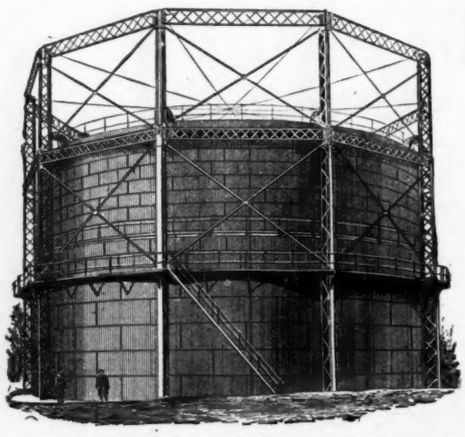

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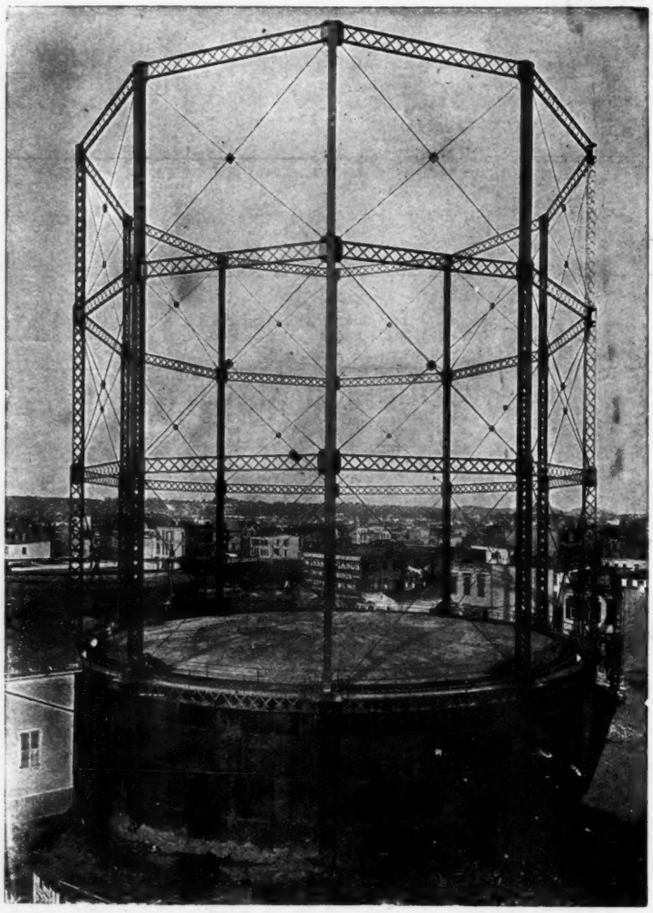

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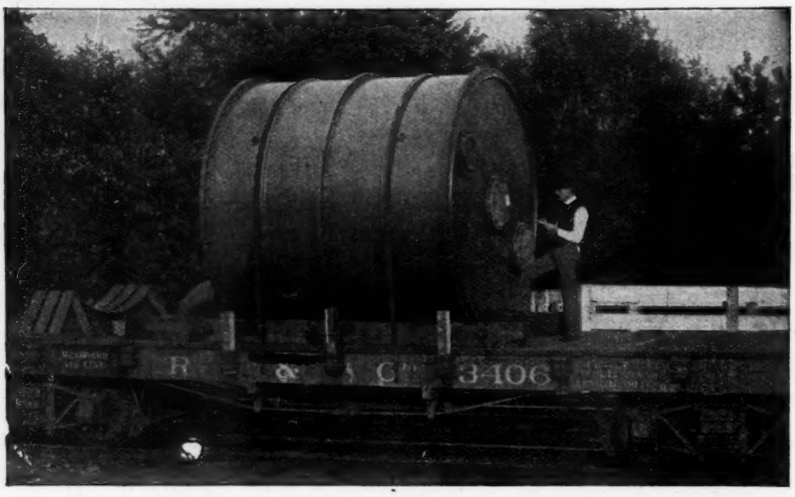

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